Title of Thesis:

Complex Uncertainty: Long-Term Risk Management Decision Making in New Zealand Local Government

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Abstract

New Zealand's natural hazardscape has long posed risks for government owned water infrastructure and its stakeholder communities. In the context of climate change, there are predictions that the frequency and intensity of natural hazard events are set to increase, but there are uncertainties about when such events might occur, and the severity and impact on water infrastructure. These threats are compounded by pressures such as population growth and constrained funding. There is a need, therefore, to consider the suitability of current governance arrangements and decision processes for the management of complex, long-term risk associated with state assets. This research, therefore, asks, are current local governance arrangements and associated decision-making processes for the management of water infrastructure appropriate for long-term risk management in an environment of uncertainty? The thesis addresses this question by critically evaluating the extent to which governance arrangements enable effective risk management decisions that protect government owned infrastructure from natural hazards.

A novel conceptual framework which matches the type of problem within the scales of time and complexity is developed on the basis of a literature review on risk management, adaptability and resilience, and modes of governance across multiple levels. This framework is then used to inform an exploration of risk management decision processes. The examination of these processes involved a participatory design involving local and central government officials and associated risk management professionals. A mixed-methods approach was applied to explore experiences of risk management as it relates to water infrastructure within local government, within the context of wider relationships with central government. Following a pilot workshop with sector actors and risk professionals to establish the broad research focus, the research involved 36 semi-structured interviews and a further workshop with sector officials to discuss the findings and critique the resulting decision-making model.

The research found that current risk management decision making is characterised by, largely, a short-term horizon, this being connected with the tendency of elected representatives to operate within the three-year election cycle. The absence of a longer-term focus is explained in part by the autonomous environment within which

councils operate, removed from central government oversight, and with little sharing of knowledge, expertise or costs of risk management. The key findings of the research indicate: a lack of consistent guidance and direction by central government to local government on adaptive risk management; a lack of coordination across the network of councils, specifically in terms of sharing knowledge, data and risk management activities; a lack of specificity in legislation regarding long term risk management which leaves risk decision making open to interpretation by councils; a culture of localised short term decision making in councils, with a low level of comprehension as to the management of long-term risks; short-term competing priorities for the financial resources required to manage risk; and a mistrust of internal guidance and advice due to the lack of in-house expertise, and a preference for external subject matter expertise.

Overall, this research has identified that the complex nature of the environment of uncertainty posed by climate change has not been adequately acknowledged within local government and this is reflected in the prevailing risk management arrangements being largely reliant on annually renewed insurance arrangements based on in-house planning practices. The decision-making framework developed in this thesis acknowledges the nature of risk and the need for adaptive approaches within the constraints of time and complexity, and has potential to inform both governance arrangements and decision processes.

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Glossary of Terms

Adaptation - The act of making changes in processes, practices, and structures to moderate risk and/or benefit from opportunities

Complexity – Complexity in risk involves interactions among people, systems, and the external environment, often making them difficult to quantify

Dynamic Change - Multi-dimensional change that is predictable on a measurable scale

Elected Representative – Local government councillor

Future Proofing - Future focussed risk management

Governance – The act of governing

Hazardscape - The summary of natural, technological, and man-made hazards along with and the risks they pose

Local Government Official - Local government officers who work for the local council. This group could be in management positions, subject matter experts or advisors and are there to ensure that council policies are put in place and council services are being delivered well

Local Government Executive – This group of senior local government managers and chief executive officers are separated from local government officials in this research in that they will have a higher delegation of duties and strategic decision making, rather than operational delivery of services

Organisational Learning - The process of creating, retaining, and transferring knowledge within an organisation. As the organisation improves, experience is gained, thus generating knowledge

Uncertainty – Where the probabilities of risk are unknown in predictions and/or assessments

Chapter 1 - Introduction

New Zealand's governance arrangements for natural hazard-related risk management and their implications for decision-making, particularly in relation to the protection of core infrastructure, were shown to be profoundly inadequate in LGNZ's (2013) review of local government's risk management arrangements. Prompted by the 2011 Christchurch earthquake series, the review findings highlighted:

- a lack of skills and expertise in local government to think about and manage risk;

- a tendency for councils to approach risk management in an isolation in terms of practice, research and economies of scale with implications for costs associated with risk management activities; and

- that the current 60/40 per cent co-funding formula for insurance arrangement[1] with central government had no basis, and in fact incentivised councils to avoid self-reliant risk management outcomes and created funding uncertainties for both parties (LGNZ, 2013).

There is a need, therefore, to better understand what appropriate governance arrangements and decision-making processes look like within the context of long-time horizons and complex risk environments. The dilemmas of time and complexity are central concerns in risk management – essentially a discipline which considers planning and managing uncertain possibilities.

Historically, organisations have managed risks by focusing on potential threats outside of the organisation, such as competition, or the changing strategic landscape, or natural hazards events, and by taking out insurance to transfer the risk to a third party (Olson & Wu, 2015). However, organisations are generally less adept at detecting vulnerabilities that create system failures, and these are not just likely but, in many

[1] In 1991 central government commenced to fund only 60 per cent of affected underground local infrastructure above a threshold laid out in section 26 of the Guide to the National Civil Defence Emergency Management Plan. Eligibility for the 60 per cent is subject to the local authority having adequately protected itself through asset and risk management including mitigation, where appropriate, and the proper maintenance of infrastructure assets; or the local authority having made sound financial provisions (such as the provision of reserve funds and/or effective insurance) to a level sufficient to ensure the local authority could reasonably be expected to meet its obligation to provide for its own recovery.

cases, inevitable (Gupta, 2017). For instance, Qazi et al. (2016) state that organisations become more vulnerable as they become more complex, and indeed the systems in place to detect or pre-empt risk can become so complex that they defy thorough understanding. In local government organisations, complexity is not just confined to problems within the immediate operating environment, but, in unitary government systems like New Zealand, is linked with challenges associated with the interpretation and implementation of central government legislation. When such legislation is complex, it leads to ambiguities and uncertainty.

A further dimension of risk is uncertainty about the planning and timeframe in which a risk might occur. Uncertainty about the imminence of risk is, therefore, a central question in risk management, not only in terms of the challenges of identifying and quantifying future risks, but also in relation to the human tendency to question the veracity of future-focus on decisions that must be made under unavoidable uncertainty (Kwakkel et al., 2016). Natural hazard events are certain to occur, and the vulnerabilities of systems tend to be revealed when exposed to such stress (NIWA, 2019). An example is the 60/40 risk management arrangement and its deficiencies which did not become apparent until they were tested, and when it was probably too late.

As a local government professional working in risk management at the time of the Christchurch earthquake series, I saw at first-hand how the inadequacy of risk management arrangements were only highlighted once a risk was realised. As the owner of the risk management portfolio for a main-centre council, I assumed all local government authorities complied with the stipulations of the 60/40 arrangements. Insurance was to be placed on the value of assets as dictated by biennial valuation exercises according to this formula. I also observed, however, council decisions being made in the face of more politically pressing imperatives that led to the underinsurance of council assets, this being explained by a lack of knowledge of asset values.

The external trigger of a natural hazard event should not be confused with the cause of this type of systemic failure. The Christchurch earthquakes, for example, did not “cause” the failure of the risk management arrangements; the systemic breakdown was not the result of a single cause but of interconnected risk factors and cascading failures (Bonabeau, 2007). Competing and urgent financial and political priorities, for

example, are a part of the reason decision makers underinsure assets in favour of other activities.[2] (Environment Canterbury, 2005). Smith (2006) states that following the Hurricane Katrina, it is generally accepted by environmental geographers that there is no such thing as a natural disaster. In every phase and aspect of a disaster - the causes, vulnerabilities, levels of preparedness and response, and reconstruction - the contours of disaster and the resultant fatalities is, to a greater or lesser extent, a social calculus. This notion is supported by Squires and Hartman (2007) who assert that the disaster event will go down on record as one of the worst in American history. This is not least because of the government's inept and cavalier response, but also the unevenness of the impact on the communities in terms of race and class (Squires & Hartman, 2007).

The connection of social construction to natural hazard events, particularly regarding institutions and their processes are becoming a key consideration of resilience. The verdict delivered in a statement to mark six years of the Sendai Framework for Disaster Risk Reduction (2015-2030) stated that the world – low income and middle-income countries in particular – is being devastated by a mistaken notion of human progress. The global use of fossil fuels, the lack of international cooperation in support of developing countries and their health systems, the destruction of the environment, unplanned urbanisation and unchecked poverty are all driving up the frequency and intensity of events (United Nations Office for Disaster Risk Reduction, 2021).

Examining the risk management approaches of New Zealand's local government has potential to inform the design of risk management decision making – in simple terms the power, scope, and the practices of governance. More generally, this can also aid the social preparedness of New Zealand to natural hazard risks.

1.1 Rationale

It is now recognised that climate change will influence the frequency and severity of natural hazard events, cause sea level rise, and produce the more intensive weather events that will increase the risk of heat waves, sea level rise, droughts from prolonged sun emission, floods and inundation as a result of increased rainfall, decrease in

[2] The 2005 Environment Canterbury and Opus International Consultants report stated that, based on engineering reports and recurrence modelling, the risk of significant seismic activity since the 1869 New Brighton Earthquake showed no known faults or sources of earthquake in the Canterbury Plains including Christchurch.

snowfall, and increased storm intensity (Ministry for the Environment, 2021). All these events carry a significant likelihood of disruption to state-owned underground water infrastructure whose safeguard and risk management are, under central government policy, the responsibility of local government. It is local government that will carry the increased risk to coastal roads and infrastructure from coastal erosion and inundation, more intensive storms and sea-level rise. These disruptions include the time and cost of repairs to damage arising from an event, and subsequent impacts on business and residents. In severe cases, the damage may result in the total loss of water services, necessitating urgent and expensive remediation, such as over ground linkages to unaffected infrastructure and the transportation of drinking water as seen during the Christchurch earthquake series. In this instance, 80% of water and sewerage systems were damaged to the point that buried pipes allowed sewage to contaminate the water supply (New Zealand Society for Earthquake Engineering, 2011).

Whilst there is a general understanding of the escalating nature of climate change impacts and the changing environmental hazardscape (Ministry for the Environment, 2021), vulnerability to natural hazards is also found in the uncertainty about future events, their frequency, intensity or location (Cutter & Finch, 2008; Jennings, 2011; Mitchell, 2010). New Zealand Civil Defence's defines the terms hazardscape as the cumulative emergency management environment, composed of all hazards, risks, vulnerabilities and capacities present in each area (Civil Defence New Zealand, 2021b). From a risk management perspective, these factors contribute to an environment of significant uncertainty for government decision makers in which one natural hazard event may initiate a cascade of other catastrophes (Lawrence, 2019). Uncertainties include:

- the effectiveness of current arrangements against increasingly complex forms of risk, e.g. levels and values of insurance, degradation of stop banks, the state of aging infrastructure versus the uncertainty of the timing and extent of the threat, e.g. predictable seasonal floods or droughts versus the location and magnitude of seismic risk;
- accuracy and age of local environmental knowledge;
- the context of timing of the problem (i.e. a short term focus maybe too early and expensive, whilst long-term focus could be too late and ultimately more costly); and

- the capacity to fund recovery in a disaster scenario (Department of Internal Affairs, 2020).

Cost is an important facet of uncertainty, as evident in the damage from the Christchurch earthquake series which ran into billions of dollars. However, the ongoing decision-making challenge of local government is constrained by a systemic culture of short-term orientated solutions driven by the three-yearly electoral cycle (Boston, 2017). New Zealand's government is responsible for managing assets over long-term time frames, but it also operates according to a short-term electoral environment with both local and central government organised around triennial elections. The Climate Change Response (Zero Carbon) Amendment Act 2019 (the Act) passed in November 2019, and the establishment of the Climate Commission, is an example of an attempt to address the focus on long-term risk associated with climate change by creating a set of institutions that will lock in a future-focused advisory body on climate-related risk.

The area of risk that is the focus of this research refers to threats to underground infrastructure from natural hazard events measured against the criteria of the NZ/AUS ISO: 31000 national standards of likelihood versus consequences. 'Infrastructure' is a term used to describe council owned underground pipes in place to deliver storm, drinking and waste-water functions to communities. The term 'institutions', unless otherwise stated, is made in reference to Young's (2002, p. 5) definition of "sets of rules, decision-making procedures, and programs that define social practices, assign roles to the participants of these practices and guide interactions among the occupants of individual roles". As such, institutions encompass formal governmental policies and rules, as well as informal social interactions and networks that may or may not be visible (Arts, 2006).

The New Zealand government institutional framework comprises the structural hierarchy that supports these rules, procedures and, in the case of this research the decision-making context and resulting risk management programmes. Local government organisations are a key site where decisions for risk management are made. This also includes the management layer that influences, through advice and reporting, how the framework and rules are interpreted. The framework and the structures are intended to manage multiple aspects of organisational responsibility, from day-to-day local operations to the adaptation to long-term threats like climate

change. Despite new risks to infrastructure associated with these threats, there has been limited leadership by the New Zealand government for the protection of infrastructure. For instance, although the Ministry of the Environment's (2020a) Framework for Adapting to Climate Change identifies infrastructure as being an emergent risk as the climate changes, it provides only generic aims for adaptation such as "We can do things like improve flood protection, change the way we build houses, roads and other infrastructure and where we build them" (p2).

Some local authorities have made efforts to be more proactive through the creation of position statements (Local Government New Zealand, 2019). Although some councils have signed up to the proposition, questions remain with others as the extent of what will be required of this informal initiative, signalling the need for more formal rules (Corlett, 2020). In part, this is due to a governance context where central government allocates responsibility for infrastructure risk management to local government, but without the direction or necessary level of resourcing. There is, therefore, a good deal of variation amongst local government authorities in their risk management practices and an uneven level of adaptation across crown and local government agencies (see Chapters 5 and 6). As with many other government structures, there is agreement that these are not designed to deal with problems of this scale and complexity (Mukheibir et al., 2013a; Reisinger et al., 2015).

Decision-making practices concerning risk management, such as the need to spend scarce resources wisely, and the safeguarding of critical infrastructure, highlight the need for a level of certainty about how to act, and about the frameworks to guide the consideration of the dilemmas that appear over long-time horizons or which display significant complexity. If, through such a lens, local government frameworks are more able to establish the security of assets in the short term, then decision makers may have less ability to contemplate the future trajectory or long-term repercussions of current infrastructure decisions. As such, this problem may also lead to path dependencies whereby the results of decisions made today cannot be easily changed or become too costly to be adapted for change over time, thus reducing future choices. Even when an institutional framework provides for the consideration of long-term risk, as in the long-term planning process within local government, there is the practical challenge of realising workable decisions due to the differing perceptions of risk, such as between politicians and technical officers, and due to differing levels of knowledge

and competing priorities (Adger et al., 2009). These combined pressures help establish the decision-making challenge that this research seeks to address.

1.2 Research Aims

The broad position of this research is to investigate and assess the adequacy of the governance arrangements for decision-making around natural hazard-related risk management and long-term planning. The further intention is to identify any opportunities that could influence and accommodate longer-term, flexible and coordinated decision-making. The focus is on council-owned and operated infrastructure, and specifically the adaptive risk management required for its safeguard against the effects of climate change.

The focus on the governance of risk management decision making within institutional frameworks and practices is in part inspired by Dovers and Hezri's (2010) review of climate change adaptation literature which identified a gap, noting:

> Institutions and institutional change are mentioned often, but rarely specified in discussions of climate adaptation. Policy change is proposed, but the detail of policy processes less often discussed. Detailed discussion of how to redesign policy processes and institutions are especially rare at the crucial jurisdictional scales of national and sub-national policy and planning (Dovers & Hezri, 2010, p. 212).

This quote highlights that efforts to improve organisations are common and include initiatives for growth, efficiency gains and cost savings[3]. However, for reasons that are explored later, adaptation associated with risk management and the supporting policies, specifically in regard to climate change, is less common. Secondly, there is a practical financial angle. The cost of insurance to an urban council such as the Hamilton City Council is over a million dollars per annum (Hamilton City Council, 2018) and will rise if climate change projections are accurate. Investment in insurance involves a trade-off between short-term and longer-term priorities, with the risk that there will be fewer funds available for immediate visible services, and uncertainty that

[3] See, for example Roland, G. (2004). Understanding institutional change: Fast-moving and slow-moving institutions. *Studies in Comparative International Development*(38), 109-131. , Wallis, W. (1989). *Economics, Foreign Policy, and United States-Japanese Trade Disputes*. https://heinonline.org/HOL/Page?handle=hein.journals/cintl22&div=27&g_sent=1&casa_token=&collection=journals

threats will happen. This research, therefore, is concerned with governance arrangements and decision practices that deal with this uncertainty, and it is informed by scholarship that draws attention to the impact of institutional frameworks and politics on decision making, particularly in relation to conditions of uncertainty and dynamic change (Boston, 2016b; Kooiman, 1993, 2003), or in other words, change that is predictable on a measurable scale. There is a need to examine how to design effective risk management decision processes and the governance arrangements that frame them, as Dovers and Hezri (2010) suggest. To date, there are few detailed studies that consider risk management decision-making regarding climate change at a New Zealand government level. Lawrence et al's (2018) research on the environmental aspects of climate change on government policy and Boston's (2016b, 2017) studies of anticipatory governance of government are amongst those most recent in this limited field. There is a gap in knowledge between the theory and practice of risk management, and this research seeks to build on and extend existing thinking in the context of long-term risk management decision making within an institutional context. In response to this knowledge gap and intellectual context, the specific aim of this research is to establish:

To what extent do governance arrangements enable effective risk management decisions that protect government owned infrastructure from natural hazard events?

In order to address this aim, the research has four objectives to determine the adequacy of the current framework and practice, namely:

1. to understand the current decision-making practices, how they are coordinated, and the implications for risk management;
2. to understand how the government framework enables these processes;
3. to identify how central government policy dictates and/or guides decision making at a local government level; and
4. to identify how short-term decision-making practices can be improved across local government to better manage long-term climate change risk.

In order to begin to address the aim and objectives, it is necessary to position the research within a specific locality to begin to understand the theoretical bases and characteristics of the institutional framework.

1.3 Location of Research

New Zealand has a significant risk exposure to a range of natural hazards that affect council owned underground infrastructure, particularly earthquakes and flooding. The Ministry of the Environment identified these as fundamental climate change risks for New Zealand that are likely to result in widespread future damage (Ministry for the Environment, 2020a). Furthermore, the huge volume of rain dumped by the increasing number of tropical cyclones, leading to severe flooding, may also be linked to earthquakes (McGuire, 2016)[4]. Flood events are the most frequently occurring hazards in New Zealand and, until the Christchurch earthquake series, have been the most costly in regards to damage (Insurance Council of New Zealand, 2014). Before the Christchurch earthquake series, 2007 was the costliest for disaster-related insurance pay-outs. Weather-related loss events totalled $96.25 million, as well as the additional costs of a magnitude 6.8 Gisborne earthquake totalling around $50 million (NIWA, 2019). However, it is predicted that these climate-related risks will be intensified by climate change (NIWA, 2019), and in consideration of the widespread future effects across New Zealand, this could result in significant social and economic consequences (NIWA, 2019).

New Zealand maintains a unitary government, based on the Westminster system, but with one legislative chamber which allocates responsibilities for disaster-related risk management across two levels of local government: regional councils which largely manage the environment and sustainable regional wellbeing, and city and district councils which are responsible for meeting current and future needs of communities through 'good-quality local infrastructure', and local public services (Local Government Act, 2002 s.10 (1)). The institutional frameworks and practices that are the focus of this research are those primarily associated with local government. As such, the research examines, primarily, local government practices, as well as how the rules, practice and involvement of central government contribute and shape those practices.

[4] The University of Miami's Shimon Wdowinski has noticed that in some parts of the tropics – Taiwan included – large earthquakes have a tendency to follow exceptionally wet hurricanes or typhoons, most notably the devastating quake that took up to 220,000 lives in Haiti in 2010. It has been known for some time that rainfall also influences the pattern of earthquake activity in the Himalayas, where the 2015 Nepal earthquake took close to 9,000 lives, and where the threat of future devastating quakes is very high McGuire, B. (2016). *How climate change triggers earthquakes, tsunamis and volcanoes*. https://www.theguardian.com/world/2016/oct/16/climate-change-triggers-earthquakes-tsunamis-volcanoes.

1.4 Research design and methods

The examination of governance arrangements for disaster-related risk management, and the decision-making processes associated with these arrangements, will employ a multimethod approach to gain insights into the frameworks, policies, and decision-making practices of both elected and appointed representatives. More detail is provided in chapter 3, but by way of introduction, the research has involved an empirical study involving interviews with local and central government actors, including elected representatives. The participants in the research were drawn from a nationwide sample of governance actors with subject matter expertise. A mix of methods was utilised which included a series of workshops, semi-structured interviews and document analysis. This approach assisted in the testing and validation of the views and experiences of the research participants. The concluding scope for considerations and improvements to the framework and practice were drawn from the sum of all of these components.

The desired outcome is to contribute towards the identification of opportunities for change and improvement of future-focussed decision making and risk management arrangements.

1.5 Structure of thesis

Chapter 2 explores the research problem, essentially, the problem context, adequacy of the current risk management practice and long-term decision-making arrangements within the government framework that deal with the safeguard of state-owned infrastructure against increasing natural hazard events as a result of climate change. This chapter describes:

- the extent and costs associated with recent disaster events;
- the failure of the current risk management arrangements and their subsequent criticism; and
- how uncertainty and climate change is set to test New Zealand's local government's legislated protection of at-risk underground infrastructure.

The overarching problems identified are factors relating to how the governance framework is ill-suited to deal with long-term complex issues like climate change. This along with the underpinning issues of a short-term orientated operating environment

renders the forward-focussed risk management arrangements required to deal with the future effects of climate change particularly difficult to create. The New Zealand government framework is summarised in this chapter in order to provide context of, and illustrate the current decision-making processes.

Chapter 3 defines the research design and process. This follows an inductive approach that draws from qualitative evidence about the current government framework and the operational norms and practices. The analytical strategy used thematic analysis of empirical information, and the establishment of a criteria for adequacy (Chapter 4) drawn from decision-relevant issues which are supported by the literature (introduced in Chapter 2). This chapter sets out the research questions, the research design rationale, the process and methods employed for this research, as well as its limitations.

Chapter 4 progresses the criteria for evaluating the adequacy of the current practice and arrangements. This is achieved by reviewing key facets of risk management practice – the approach to understanding the risk in hand, its management, and the long-term management going forward. This analysis leads to the identification of criteria that was used to assess the adequacy of the New Zealand government framework (Chapter 5) and the practice within (Chapter 6).

Chapter 5 discusses the findings of the investigatory phase of the research and describes and assesses the adequacy of the New Zealand government framework as it supports long-term risk management for addressing uncertainty and climate change. This is achieved by describing and analysing the framework and decision-making hierarchy, the procedures and their linkages between central and local government. The framework is then tested against the criteria developed in Chapter 4 towards adequacy and ability to address uncertainty and climate change characteristics. This chapter concludes with an overall summary of the adequacy of the framework.

Chapter 6 reviews the findings of the research as to the current practice within the government framework. This is grounded in a thematic analysis of the data collected from the semi-structured interviews, workshops and from document analysis. As with Chapter 5, the adequacy of the practice in meeting the long-term risk management decision making required to address uncertainty is assessed against the criteria

developed in Chapter 4. Chapter 6 brings these issues together with an analysis of the overall adequacy of the practice.

Chapter 7 explores the options looking forward towards positive change within the governance framework and practices based on the discussion and findings from the previous chapters and suggestions from the research participants. These opportunities for change are recognised as enablers and entry points for application against the decision-relevant categories of issues that were identified in the literature in Chapters 2 and 3.

Chapter 8 concludes this research through the summarising of the key themes and findings as to the adequacy of the current decision-making framework and practice in the addressing of the long-term risk management required to safeguard government owned underground infrastructure against the future effects of climate change characteristics. The chapter and thesis closes by discussing the contribution to knowledge that the findings make towards scholarship regarding New Zealand government's risk management and planning, the constitution of decision makers to enable this, and the further research that will assist in addressing the 'operational gaps' between government frameworks and decision-making practice.

Chapter 2 - New Zealand's current risk profile and the governance arrangements for risk management decision-making

2.1 Introduction

The purpose of this chapter is to introduce the context of the research problem. The research seeks to address the adequacy of long-term risk decision-making by focusing on identifying and understanding the governance arrangements and decision processes for risk management in an environment of heightened risk of disaster, through the specific case of underground infrastructure. Infrastructure plays a central role in economic growth, social wellbeing, and is also critical as a lifeline during a disaster event (Hamilton City Council, 2018). The environment of uncertainty brought about by increased natural hazard events, such as those associated with climate change, poses significant challenges. Such uncertainty has created a more urgent awareness of the need to protect infrastructure precisely because of its dual roles in economic and community wellbeing (Maletskyi, 2019).

This chapter describes the background to the research by referencing recent key natural hazard events, their associated costs, and concerns that emerged about the quality and timeliness of central and local government planning and decision-making. The New Zealand government framework is also summarised as a way of establishing the context within which the policy actors operate and decision-making occurs. A brief introduction to the basis of the analysis, which is carried out in subsequent chapters, is provided. Finally, a discussion around risk management as it applies across the complex government networks is presented.

2.2 Introducing water infrastructure

In New Zealand, the "three waters" systems (potable water, wastewater and storm water) are delivered as a core requirement of local government authorities under the Local Government Act 2002. The three waters network infrastructure and associated treatment plants that service urban towns and cities, and the rural community, typically considered to be self-sufficient. The scale of the systems is significant with replacement value estimates of storm water infrastructure being $11.2 billion and $17.8 billion for the waste water network (Infrastructure New Zealand, 2020). In all, New Zealand's storm water and wastewater assets include 24,000 kilometres of public

wastewater network with more than 3,000 treatment plants, and over 17,000 kilometres of storm water network (White et al., 2017).

The estimated replacement value of Three Waters assets is around $51.4 billion representing around a quarter of local government expenditure (Figure 1). Before the Covid-19 pandemic, Capital works out to 2025 were expected to cost $12.8 billion, and in a post-pandemic environment this needs to be significantly revised upwards (Infrastructure New Zealand, 2020). In the meantime, much of this infrastructure is ageing with key parts vulnerable to natural hazards. Increasing urbanisation, population growth, economic growth, climate change and increased service standards add even more pressure (Infrastructure New Zealand, 2020). Spending, of course, varies in accordance with the size and type of local authority.

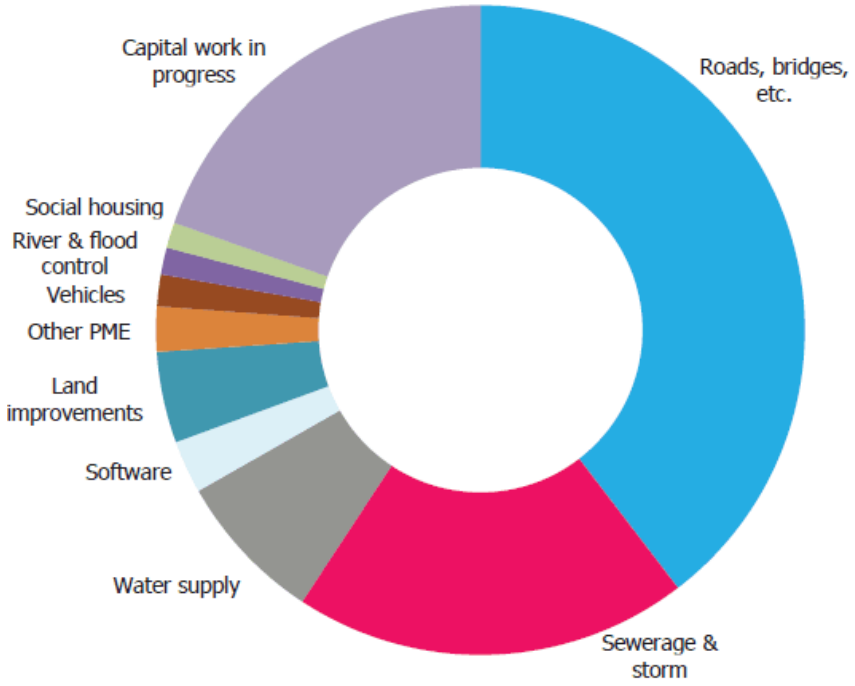

Figure 1: Areas of Local Government Asset Expenditure

Local government is guided by the Local Government Act 2002, which dictates the sector's purpose. It can be summarised as the enablement of democratic local decision-making and action by (and on behalf of) communities in order to meet current and future needs (Local Government Act, 2002 s.10 (1)). The Local Government Act 2002 also stipulates the requirement for, and provision of, quality infrastructure through strategic long-term plans (LTPs) where the authority must identify significant

infrastructure issues and how they will be managed through financial investment, maintenance, risk management and insurance in consultation with their communities.

Local government underground infrastructure is often integrated with infrastructural assets owned by central government, which include, for example, the state highway network. This integration is also shared with the private sector. Private developers are important builders of, and contributors to, the infrastructure that is required for community expansion via property development. Not only are the ensuing development contributions paid to local government a significant source of revenue, but the infrastructure that developers create is often transferred into local government ownership and operational responsibility (Department of Internal Affairs, 2017).

Section 6 and Part 5 of the Local Government Act 2002 allows councils to own, operate and provide infrastructure through Council Controlled Organisations (CCOs) of which there are more than 200 in existence. A CCO is typically registered as a company consisting of 50 per cent or more council ownership, or registered as another legal entity where a council or councils control more than 50 percent of voting rights. In either scenario, legal separation from the council(s) is required by the enabling statute (Department of Internal Affairs, 2017). The assets for which the CCO is responsible may be leased by the council but remain the property of the New Zealand government.

Three relevant points can be identified. Firstly, this infrastructure is an important asset that provides lifelines and is essential to community wellbeing. The second is that this service has to be provided to a good quality standard by local government under the LGA 2002. Doing so not only includes the provision of the three-water service, but also its risk management. The third point is that local government risk management practice is largely reliant on central government funding following a natural hazard event. However, the extent to which central government should provide more funding to local government for the financing of risk management initiatives continues to be debated at a parliamentary level. These debates have highlighted the need for significant reforms across the three waters and resource management to be joined up, ideally in a ‘future of local government’ governance programme (LGNZ, 2020a). The overarching problem is the ill-suited nature of the governance framework to deal with long-term complex issues like climate change and the extent to which critical infrastructure is protected against future risk. The focus of this research is on decision-

making for long term planning as it relates to council owned and operated infrastructure, specifically the adaptive risk management required to safeguard it against the effects of climate change. The research will, therefore, require an examination of decision making across central and local government networks, and this is discussed in the next section.

2.3 The Multi-level Governance Context

Multi-level governance is a term used to describe the method by which power is distributed vertically between the different levels of the government framework (Cairney, 2011). The term recognises the various levels of government comprising of local, regional, central, as well as the many other crown entities with interests in policy decisions and outcomes. It captures how, within this environment, the different levels of government share or devolve responsibility amongst each other.

In a New Zealand government context, Parliament creates laws and, through the respective central government agencies which allocates responsibility, it mandates to local government the power to make and enact decisions on its behalf (New Zealand Parliament, 2017). Local government in New Zealand consists of 11 regional councils and 67 local councils (13 of which are 'city councils' which includes Auckland Council[5]) (Department of Internal Affairs, 2017). Following a general election, once a government is formed, it becomes accountable to Parliament for its actions and policies. The chief decision-making body of New Zealand's government system is the cabinet, which consists of appointed ministers who maintain responsibility of holding various portfolios of the government. Only elected MPs can be ministers and they are accountable to Parliament for their policies and actions, and those of the departments and agencies for which they are responsible (New Zealand Parliament, 2017).

The Local Government Act 2002 enables local government agencies to operate independently as well as authorising elected representatives to fund council activities on behalf of the communities that they represent. As part of this remit, local government has the responsibility of managing and maintaining infrastructure, compliance within the Local Government Act 2002, and the monitoring of the 'three waters' systems. Activities are planned and budgeted for via 10-year strategic LTP's

[5] Auckland Council being an agglomeration of multiple neighbouring LGAs

and 30-year infrastructure plans that, by requirement of the Act, are to be informed by up-front community consultation. Further to this, the Local Government Official Information and Meetings Act 1987 theoretically ensures transparency and enables public access to information relating to rate-funded activities.

Revenue is generated by central government largely via levies such as personal income tax, business taxes, and GST (the goods and services tax that is added to almost all goods and services in New Zealand). Similarly, local governments raise much of their revenue through levying taxes on private and commercial property through the rating system. It is with this revenue that local government is enabled to draw on and invest in infrastructure as well as fund its risk management. However, this is only one function provided by local government and, therefore, it must contend with many competing priorities and public policy aims.

In a typical financial year, about 15% ($1.15 billion in 2016) of the total revenue of all councils comes from central government subsidies or grants, with most council expenditure consumed by roading and transportation systems (29% of all operating expenditure) (Department of Internal Affairs, 2017). Opposite to revenue, there is of course debt. The government calculates national debt through the comparison of what it owes with what it produces, or its gross domestic profit (GDP). New Zealand's central government carries a national net core debt to GDP which is currently 30.9 percent ($99 billion) as at the end of November 2020 (New Zealand Treasury, 2021) This is an increase from 27.6 percent as at June 2019 almost exclusively as a result of costs associated with the ongoing COVID response (New Zealand Treasury, 2021). Olsen's (2019) report shows that local government gross debt levels are increasing over the next decade, with a focus on replacement of existing infrastructure rather than investing in risk management and accommodating growth. Olsen (2019) states that gross debt levels in councils continues to increase as population pressures, tourism growth, and ageing infrastructure come together to form a perfect storm. As such total local council liabilities ("gross debt") in New Zealand is expected to rise to 205% of operating income on average over the next decade, up from 176% on average over the previous decade.

The need to fund investments in the risk management of infrastructure means that different funding options are important going forward. Recent research from LGNZ

found that local government in New Zealand receives the smallest comparative share of total government funding in the developed world (LGNZ, 2017b). This small share of central government funding suggests potential for more investment by central government to local government, either as pure cash payments, or as project-based subsidies.

. Shand's (2007) Rates Inquiry outlined other alternative funding options towards local government financial autonomy and encouraged councils to use more debt to finance capital expenditures. There are no formal limits on council borrowing (reflecting financial autonomy) except for a requirement that councils compare their debt position with certain financial benchmarks, which were developed by the Department of Internal Affairs and set out in the Local Government (Financial Reporting and Prudence Regulations) 2014. The more recent Productivity Commission (2019) report into local government funding considered payments from central to local government based on building work put in place, and more funding from tourism levies (national or local). However, the report also recommended that:

- **Councils need to lift their performance to help manage funding pressures**. This includes making better use of all existing funding tools. Transparency is key, and a number of recommendations are aimed at improving the transparency of local government funding decisions and performance.
- **A better relationship between central and local government is essential.** An agreed protocol would help end the practice of central government imposing responsibilities on local government, without appropriate funding. The Crown should also be paying for council services it receives on its properties and developments (New Zealand Productivity Commission, 2019).

Councils face a complex and challenging future, with many competing business as usual and political issues, and only a small pool of money by which to fund them. Over the next decade, councils are currently expected to replace rundown assets, ahead of projects which would improve service levels or add more capacity to cope with growth (New Zealand Productivity Commission, 2019).

Decision-making within triennial electoral cycles within this governance context is, therefore, ill-suited to deal with long-term complex issues like climate change. Discussion of multi-level governance provides the context by which power and

responsibility are devolved within the framework. The discussion of financial arrangements at a local government level also provides a context of competing priorities. The risk management of infrastructure can be considered as a somewhat intangible practice, that is, insurance cover can be costly, but is an 'unutilised' expense until there is a call to claim on the policy. In other words, it can be difficult to see the value in risk management arrangements such as insurance if nothing happens.

The example of Hamilton City Council's spend of over a million dollars per year on insurance cover for infrastructure points to the potential need to have evidence of future impacts in order to build a case for expenditure approval. For example, approval from elected representatives for large investments in risk management may be more difficult to obtain in areas such as Hamilton where there are competing priorities associated with high growth (Hamilton City Council, 2015) and a low number of natural hazard events (NIWA, 2019). A million dollars may only be a small percentage of a large council's operating budget, but in consideration of competing priorities that may be more popular with the community, this is a significant sum of money.

2.4 Risk Management within a Multi-level governmental Context: Underground Infrastructure

As well as the provision of water services and associated infrastructure, the management of risk associated with natural hazards to these assets falls upon local government as part of an institutional arrangement that comprises authority held at national, regional and local levels. Consideration of the potential impacts of natural hazards is part of this regime (New Zealand Parliament, 2017). At a local government level, the management of risk is legislated under the Local Government Act 2002, and is underpinned by the LTP process and supporting regulations such as the Disaster Recovery Plan. The regulations provide 'rules' which outline central government's expectations of risk management arrangements via insurance that local governments need to make.

The Disaster Recovery Plan was introduced in July 1991 by central government placing specific responsibilities on local government in order for them to be eligible to share the restoration costs of infrastructure. The Plan states that:

> "Beyond a threshold, central government will only pay 60% of restoration costs. Local government is responsible for the remaining 40% thus

effectively moving part of the onus from the tax payer to the ratepayer" (Local Authority Protection Programme (LAPP), 2016).

Accordingly, central government will provide the 60% contribution following a major catastrophe provided that a council can demonstrate that it can meet the remaining 40% through:

- Proper maintenance;
- The provision of reserve funds;
- Effective insurance, and/or
- Participation in a mutual assistance scheme with other local government authorities.

In short, the cost and importance of maintaining good quality infrastructure is mandated to local government through the LGA 2002. The risk management expectations of these assets are set within the Disaster Recovery Plan. These arrangements and expectations are largely concerned with the ongoing delivery of service and the protection of council-owned assets from natural hazard events. Climate change has been identified as a key driver for the increase and intensity of natural hazard events and, within the multi-level framework a layer of state sector organisations exists. The functions of these government entities covers a wide range from health care to national defence services, and includes scientific organisations which provide research and knowledge associated with climate change which contributes to rules and risk management decision making. Table 1 provides a list of those considered to be more directly associated with climate change risk.

Table 1: Abridged List of Central Government Agencies Associated with Climate Change Adaption .

Public Service	Ministry of Business, Innovation and Employment Department of Conservation Ministry for the Environment Department of Internal Affairs Department of the Prime Minister and Cabinet Statistics New Zealand The Treasury
Crown Entities	District Health Boards (20) Earthquake Commission Energy Efficiency and Conservation Authority Environmental Protection Authority New Zealand Transport Agency
Crown Research Institutes (CRIs)	AgResearch Limited Institute of Environmental Science and Research Limited Institute of Geological and Nuclear Sciences Limited (GNS) Landcare Research New Zealand Limited National Institute of Water and Atmospheric Research Limited

As indicated in Table 1, The Ministry of Civil Defence and Emergency Management (MCDEM) operates as a business unit of the Department of the Prime Minister and Cabinet. Under the Civil Defence Act 2002, MCDEM are responsible for providing leadership and support around national, local and regional emergencies. New Zealand's Treasury provides strategic policy advice with regard to fiscal regulation of the national economy as well as producing a range of economic research and data. The Treasury is responsible not only for the day-to-day monitoring and management of the financial affairs of government, but also for providing advice about the economic and financial implications of natural hazard events as they occur.

The natural environment is largely researched by The National Institute of Water and Atmospheric Research Limited (NIWA), and GNS Science. The Earthquake Commission (EQC) is a New Zealand government owned entity that provides primary "natural disaster insurance" to residential properties by levying policyholders to finance cover for a major portion of earthquake risk (Earthquake Commission, 2017). EQC limits its own risk by reinsuring with large insurers (Earthquake Commission, 2017). EQC pays out the first NZ$1.5 billion in post-event claims with the reinsurance companies being liable for all amounts between NZ$1.5 billion and NZ$4 billion. EQC are then liable for any amounts above NZ$4 billion (Earthquake Commission, 2017). NIWA provides a raft of research scientific research services via thirteen National Centres. NIWA's findings contribute to and complement the knowledge base of environmental science shared with similar agencies such as GNS Science, which focuses earth and geosciences.

The above entities contribute to the multi-level governing framework and, in theory, carry out the governance process in a coordinated and collective manner. A feature of the governance framework that weakens the practice of coordinated, collective decision-making is that it is organised around the principles of subsidiarity, whereby each of the various activities of government is distributed vertically down to the lowest level of local government, with no horizontal connection (Bradford, 2005; Norton, 1994; Saint-Martin, 2004; Schwager, 1999). The problem and consequence of this approach is that national policies can become enacted via a blanket application. The lack of horizontal connectivity ensures that policy is written in isolation whilst the one-way vertical cascading of rules does not take into account the very significant differences among regions and communities (Leo, 2006). As such, there is an increasing need to

consider new modes of governance. These decision-making arrangements should not only be tailored to the nature of the timing and complexity of the problem, but also the characteristics of the organisation and/or the network created. The current statutory framework and hierarchy of functions are summarised in Figure 2. Adapted from the Office of the Auditor General's (2013) model, these statutory responsibilities, regulatory provisions and the supporting institutions and networks encompass the government framework referred to extensively throughout this thesis, particularly concerning the nature of the relationship between local and central government.

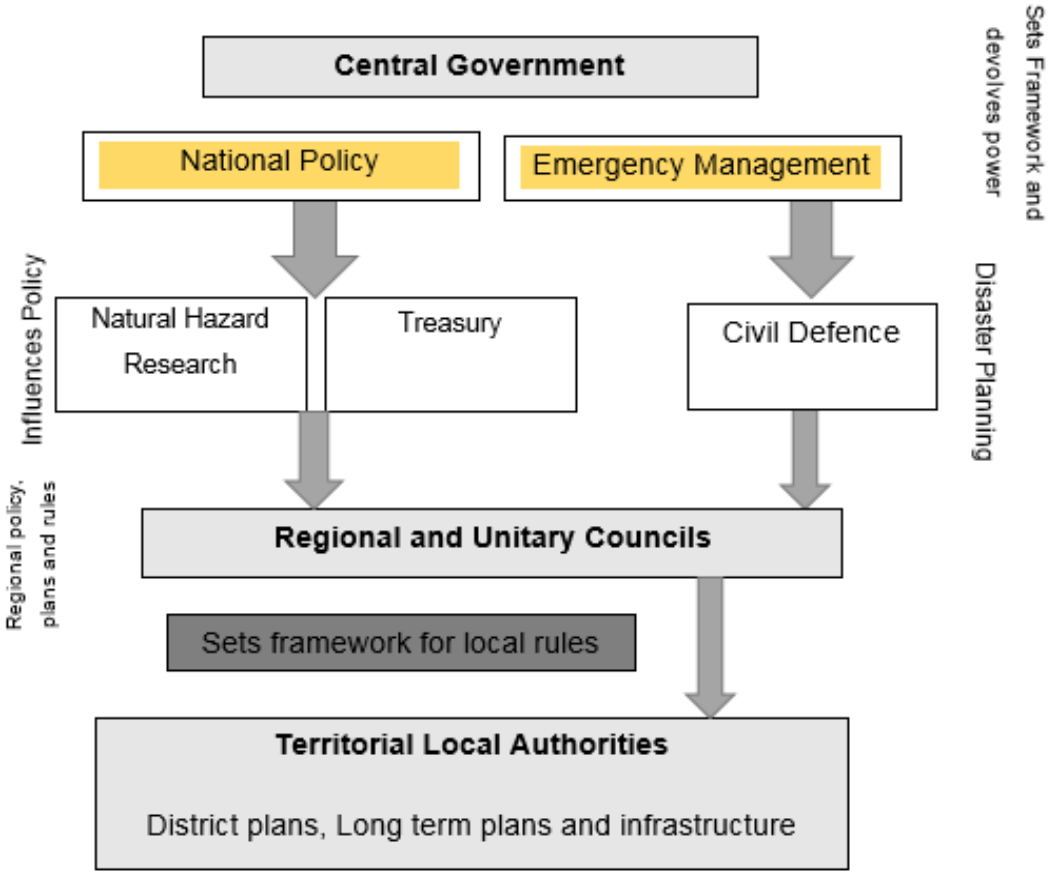

Figure 2: The New Zealand Government Framework

In summary, two observations can be made at this point. Firstly, it can be seen from Figure 2 that there is a multi-level approach based on the principle that it enables the coordination of a range of actors across different levels of government. A contradictory tension is the requirement to comply with the rules and guidance from central government and crown entities, as described in Table 1. There are questions about how effectively this design operates in practice, and concern that these governance arrangements fail to accommodate regional difference and can lead to standardised

policy approaches (Leo, 2006). With local government operating in a way that is distanced from the central government, according to Moe (2004), there is potential that it takes an entrepreneurial approach in interpreting how these rules are applied (Moe, 2004). Given that councils appear to be left to manage their own resources, entrepreneurial in this sense is the approach by a council to construe how rules are applied to solve their own problems by using/repurposing their own resources at hand. Furthermore, within the context of a top down governance structure, it is unclear if the framework enables the capacity to respond directly to, or challenge, or even tailor its devolved responsibilities, degrading the value of local autonomy (Leo, 2006).

Secondly, a theme that emerges from the subject of financing risk management is that much of central and local government is delivery of services that are part funded by debt (Wheeler, 1996). Central government carries national debt whilst part-funding local government, which in turn takes on further debt through borrowing to fund high cost activities - including the provision and maintenance of underground infrastructure (Local Government Funding Agency, 2015). While accrual of debt can be considered 'business as usual' (Wheeler, 1996), a potential problem concerns the allocation of debt. If money is directed to fund evidence-based solutions, it is unclear as to the extent that potential problems with significant uncertainty are recognised and taken up. The unforeseen costs associated with natural hazard events may need to be met at any time, as stated by Seville (2017), but the increasing costs of risk management in respect of climate change are seldom acknowledged. For instance, following the Christchurch earthquake of 2010, the cost of infrastructure reparations and residential claims to government via EQC were estimated to be NZ$2.75–3.5 billion dollars (National Library of New Zealand, 2017). The 2016 magnitude 7.8 Kaikoura earthquake resulted in reparation costs of $2-3 billion dollars (McDonald, 2017). Such unforeseen events presented significant financial cost to central government, and the likelihood that they will occur introduces an environment of economic uncertainty for both central and local government.

2.5 Current Risk Management Arrangements

Local government risk decision making regarding infrastructure takes place within institutional and financial constraints, and competing social, environmental and economic service delivery priorities (Boston, 2016a). These priorities include care of the natural environment such as rivers and catchment areas, social housing and

community safety, and the funding of local activities through local government grants (LGNZ, 2017a).

There are a wide range of policy actors within local and central government associated with the risk management decision making which this research concerns. These actors include elected representatives (councillors), administrative officials which includes management, risk professionals and various subject matter experts either employed within government or contracted advisors. Given that local government operates within a triennial cycle, risk management decision making has a tendency to be operationally focussed and favours the short-term. An example of this in a localised context could be annual insurance renewal. Given the three-year election cycle, commitment to risk management is the year on year renewal of localised insurance policies rather than taking a longer term, coordinated national view (Boston, 2016a). The annual cycle of elected representative's approval of insurance policy renewals is based on the advice and guidance of the culmination of administrative officials and external experts through the lens of a 12-month period (LGNZ, 2016).

Conversely, interventions and strategies to mitigate the cost of damage to infrastructure from natural hazard events are required long before damage occurs (Stafford-Smith et al., 2011). This is due to the timeframes afforded to decision making as well as the time taken to perform the activity being decided. Additionally, intervention is often perceived as expensive in regard to future benefits (Hallegatte et al., 2012), certainly against the back drop of the short-term triennial lifecycle of local government. Infrastructural assets are expected to have lifetimes of many decades in a fixed location and the value of the asset will change over time. This is significant in that its futureproofing is based around a short time horizon of risk management decision making.

In an attempt to cope with meeting the 40% contribution obligation, some neighbouring local authorities have created entities called Local Authority Shared Service (LASS). Taking the Waikato regional cluster as an example, the Waikato LASS is a company owned by twelve member councils including Waikato Regional Council, Hamilton City Council, Hauraki District Council, Matamata Piako District Council, Otorohanga District Council, Rotorua Lakes Council, South Waikato District Council, Taupo District

Council, Thames Coromandel District Council, Waikato District Council, Waipa District Council and Waitomo District Council.

The entity was established in 2005 with the objective of promoting shared services (and costs) between local authorities across the Waikato region. By working together, the main driver for WLASS arrangements is to enable councils to save money and increase efficiency by jointly entering into contracts and agreements, and by working collaboratively (LASS, 2018). Much of the work undertaken by WLASS is by working parties or advisory groups made up of staff representatives from the shareholding councils who have expertise and interest in particular services. Combined service purchasing allows member councils to access cost savings via an economies of scale approach, and purchases are funded on a user pays basis with each council paying and receiving the financial benefits of its share. This arrangement covers many services, including the procurement of insurance. It is worth noting at this point that LASS arrangements are sporadic and in place across only some of the local authorities of New Zealand's North Island, specifically Hawkes Bay, Waikato, Bay of Plenty and Manawatu regions (LASS, 2018). By implication, all other councils in New Zealand are purchasing insurance on an individual basis. In regards to the logistics of decision making and associated adherence to the requirements of the 60/40 arrangements, the operations of risk management in practice at the local government level of may contain constraints. With only pockets of collaboration, these problems appear to be largely concerned with decision making in isolation. The reasons for this are unclear at this stage, but this may be connected to the lack of horizontal integration across the local level (Leo, 2006). This may be due to the blanket requirements posed by the 60/40 arrangements failing to meet the needs of individual councils for reasons of loss of local autonomy and affordability of risk management whereby a council may be able to afford its own arrangements without requiring to compromise with another.

2.6 Criticism of Current Risk Management Governance Arrangements

In 2016, Treasury raised serious concerns about the lack of appropriate risk management by the local government sector (Local Government Risk Agency, 2016). The report identified that underinsurance was a key driver of these concerns and was becoming recognised as a widespread problem (Local Government Risk Agency, 2016). Largely driven by the underinsurance of Christchurch City Council's infrastructure the identified lack or inability to appropriately manage risks at a local

government level financially exposed central government as a result (Edmunds, 2016). For example, the report highlights inadequate governance through low levels of elected representative engagement, a limited approach to risk management through the isolated acquirement of environmental knowledge, and the lack of willingness and/or ability to calculate accurate rebuild costs, largely as the result of isolated, informal approaches to procure and share knowledge (Edmunds, 2016). In summary, the risk management and decision-making functions were found to be lax, lacking direction and generally inadequate.

The inadequacy of governance and risk management arrangements was not found to be confined to Christchurch City Council. Previous research conducted by the Office of the Auditor General in 2013 found that the impact of the inadequate management of risk was that around 60% of many local authorities' assets had no insurance cover. Aside from uninsurable assets such as land, the unprotected assets were found to largely include underground infrastructure due to the expectation of full financial assistance from central government in an event (Office of the Auditor-General New Zealand, 2013). The common reason for this was that the cost of insurance outweighed what was considered to be the risk, with Auckland Council, Christchurch City Council and Watercare (who are excluded from the 60/40 arrangement) holding the most significant portion of uninsured assets (Office of the Auditor-General New Zealand, 2013).

The outcome of this poor risk management is found in the underinsurance of Christchurch City Council where the costs of 2011 Canterbury earthquake series are believed to be between 500million and $700 million (Grigg, 2014). The Council's subsequent 2015 LTP seeks to increase levels of insurance cover of the City's assets which extends to full earthquake cover for above and below ground buildings valued at $1.4million. The remaining buildings (totaling $157 million) with individual values of less than $2 million will remain self-insured (Christchurch City Council, 2015). However, in regards to underground infrastructure, the council has purchased limited cover and is reliant on having sufficient borrowing capacity to fund 40 per cent of any damage incurred through an event with the (unlegislated) "expectation of central government assistance for the remaining 60 per cent" (Christchurch City Council, 2015, p. 25).

Further to the 2016 Treasury report, and in light of the financial lessons learned from the insurance shortfalls from the Canterbury earthquake series, central government decided to review the 60/40 assistance scheme (Local Government Risk Agency, 2016). The review was critical of the current central/local government risk management arrangements stating that:

- 25 percent of local authorities did not have a risk register, framework or any other formal approaches associated with risk management decision making;
- 30 percent that have risk registers do not review them at least annually;
- 50 percent of authorities have little understanding and/or up-to-date knowledge as to risk exposure, documentation of historic event impacts and/or the potential financial liability faced by the council (Local Government New Zealand, 2013).

This points to a number of issues regarding risk management and governance. In summary, the discussion in section 2.4 about the effectiveness of the current governance arrangements and decision-making practices are leading to important regional differences in policy associated with risk management (Leo, 2006), and local government operating in a way that is distanced from central government (Moe, 2004). Furthermore, the above points imply problems are linked to limited expertise and knowledge at the local government level. This also identifies inadequacies in the quality and level of advice provided to decision makers who require assurance that appropriate and adaptive measures are in place.

Recommending a revised approach, the review stated that:

> *The 60/40 per cent co-funding arrangement for underground infrastructure damage caused by a natural disaster has no basis for its formula, [that] it incentivises councils to avoid risk management decision making, and fundamentally favours short term approaches to the long-term uncertainties of climate change across local and central government* (Local Government New Zealand, 2013).

These findings and recommendations highlight a number of issues. They form a picture of fragmentation in that risk management practice and advice, with decision making occurring in isolation with little evidence of long-term adaptive consideration, cross-boundary collaboration and sharing of knowledge and expertise. This critique

leads to the key focus of this research being on the governance and operational environment, and on identifying steps that might be taken towards improvement in a way that will lead to more appropriate foresight and planning for readily detectable risks.

Boston (2016a) criticises the current governance arrangements and the way they contribute towards the length of time it takes for governments to;

> Adjust regulatory policies to reflect changing technologies (e.g. Drones or autonomous vehicles) or social conditions (e.g. evolving family structures) … [failure] to consider the economic and social implications of major technological innovations, such as advanced robotics and artificial intelligence (Boston, 2016a, p. 14)

In short, this describes an environment where governments are failing to exercise proper and adaptive risk management foresight. Boston (2016a) identifies the problem in terms of the need for more anticipatory governance. The focus of this research is on understanding better the way current governance arrangements for risk management decision making are contributing to these problems.

In suggesting that this is likely due to the lagging adjustment of regulatory policies compared with the pace of changing environmental conditions, Boston describes these problems as 'creeping' and that they have the potential to cause significant long-term harm. However, Boston (2016b) argues that such risks receive far less attention from decision makers than they deserve, and the possible outcome of this may reduce or even eliminate the possibility of identifying or enacting proactive low-cost solutions. The result of this failure to manage risk will eventuate in transferring the financial burden of mitigation onto future citizens and ratepayers.

Boston (2016a) describes four reasons as to how this policy problem might occur. Firstly, is that the problem may not be detected and/or communicated sufficiently early to decision makers. Second, is the short-term focus and competing priorities of decision makers to remain elected causes a distraction and culminates in an 'out of sight, out of mind' approach over remedial action. Third, with reference to local government, many creeping problems may be cross-boundary and thus require coordinated responses. However, obtaining this coordination is often difficult due to

the structure of New Zealand's government departments and agencies which sees local government agencies acting in isolation. Finally, given that these risks are complex and lack definitive solutions, cost may play a significant role, falling disproportionately in the short term with benefits unrealised for many years. Given this, Boston states that action to mitigate the risk may be suspended.

A number of issues have been identified in this section that specifically relate to making decisions in a climate change driven environment laden with risk, uncertainty, and financial constraints. Following recent natural hazard events, it is clear that New Zealand's local authorities are taking inconsistent approaches to risk management. It is unclear now if this is due to isolated interpretation of central government rules and legislation by central government decision makers, and/or the distanced locations of central and local government within the framework. Given the top down nature of the government framework, local government are devolved responsibility, but are well distanced from central government. Operating in an isolated environment gives rise to the possibility that local government agencies may interpret central government guidance on an individual basis and accordingly, there are differential outcomes across councils.

A second issue is in decision making, specifically in what kinds of issues it is well able to consider and which it is less able to do so. Given the influence of LTPs, it appears that investment decisions, predominantly in a local government setting, are significantly influenced by the triennial election cycle. This raises the question of balance in if the need to provide tangible results to the community and maintain/reduce rates in order to remain elected could affect the decision making around the prioritisation of investment in unseen infrastructure risk management. Moreover, the question could be raised as to the quality of the governance structure that is making the decisions as well as the value of the direction that it is taking.

A third issue is LGNZ's (2013) observed inconsistencies in formally coordinated approaches to sharing knowledge as it applies to the risk environment. If research is unfunded and piecemeal in approach, this gives rise to the consideration that the opportunities provided by collaborative information and knowledge sharing towards informed decision making and future orientated risk management are likely limited.

Understanding New Zealand's hazardscape is, therefore, an important step in the risk management decision making which safeguards government owned infrastructure from natural hazard events, and this is will be discussed in the next section.

2.7 The Current Risk Environment - Natural Hazards in New Zealand

New Zealand is highly vulnerable to natural hazards and associated disaster events (Earthquake Commission, 2017). Vulnerability is described by Civil Defence New Zealand (2017) as the characteristics and circumstances of elements at risk (e.g. human life and property) that make them susceptible to the damaging effects of a hazard. The natural hazards that New Zealand is exposed to include earthquakes, tsunamis, landslips, volcanic activity and floods resulting from heavy rains and extreme weather events (GeoNet, 2017).

GNS states that an average of 15,000 earthquakes are located in New Zealand each year, with 100 – 150 of these being large enough to be felt (GNS Science, 2017). However, 2016 heralded a new annual record of 32,828 domestic earthquakes (GeoNet, 2017). Records dating from the 1840s show that New Zealand can expect several magnitude 6 earthquakes every year, one magnitude 7 every 10 years, and a magnitude 8 every century (GNS Science, 2017). Between 1992 and 2007 New Zealand experienced over 30 earthquakes of magnitude 6 or more (GNS Science, 2017) and, of the 32,828 earthquakes in 2016, the traditional estimates increased through two earthquakes of magnitude 7+, 10 of which measured magnitude 6 to 6.9, and 122 between magnitude 5 and 6 (GNS Science, 2017).

Since December 2002 (excluding the Canterbury earthquake sequence) six events have resulted in the requirement of financial assistance from central government to 19 local authorities for essential infrastructure recovery repairs (Statistics New Zealand, 2019). The cost to the central government in meeting the claims was $3 billion (Statistics New Zealand, 2019). By far the most expensive to date, the monetary cost of damage attributed to the Canterbury earthquake series is subject to much conjecture. However, there is some commonality in the suggestion that the figure is likely somewhere between $45 billion and $50 billion dollars (Newshub, 2017).

Floods are the most frequent and costly natural hazard in New Zealand. Between 1920 and 1983, the country has experienced 935 damaging floods (NIWA, 2019). The Insurance Council of New Zealand has calculated that claims for flood damage

between 1976 and 2004 averaged $17 million per year (Insurance Council of New Zealand, 2017). However, economic loss goes beyond the cost of the asset damage – for example, central government expenditure on civil defence responses during flood emergencies alone averages about $15 million per year (Insurance Council of New Zealand, 2017). The costs of disaster events can easily run into billions of dollars. However, beyond the financial costs of physical damage caused by a disaster event, expenditure also cascades on to social costs which may continue long after the incident. In New Zealand, for instance, over $30 million dollars has been invested in mental health services to the community by Canterbury District Health Board since 2012 (Stewart, 2016). Yet the physical and financial costs to the community through the inclusion of, but limited to marriage/relationship break ups, interruption of children's education, relocation, interrupted employment, disruptions to social networks and loss of social capital attributed to the social stress of a disaster event typically goes unrecorded and can provide long-term effects (Noy & duPont, 2016).

2.8 Climate Change

It is now well established that there is a high likelihood of severe and widespread impacts which can be attributed to climate change through the exacerbating of existing hazards as well as the creation of new ones (NIWA, 2019). There were three times as many global natural hazards disasters from 2000 to 2009 compared to the period 1980 to 1989, with 80% of this growth credited to climate-related events (NIWA, 2019). The scale of disasters has likely expanded due to increasing rates of deforestation and environmental degradation which are thought to contribute to more extremes in climate variables such as higher temperatures, precipitation and more violent weather events (Guha-Sapir, 2016).

The World Economic Forum Risk Report (2017) identifies extreme weather events and natural hazards as the top two global risks when measuring the likelihood and impact of risk occurrence (see Figure 3).

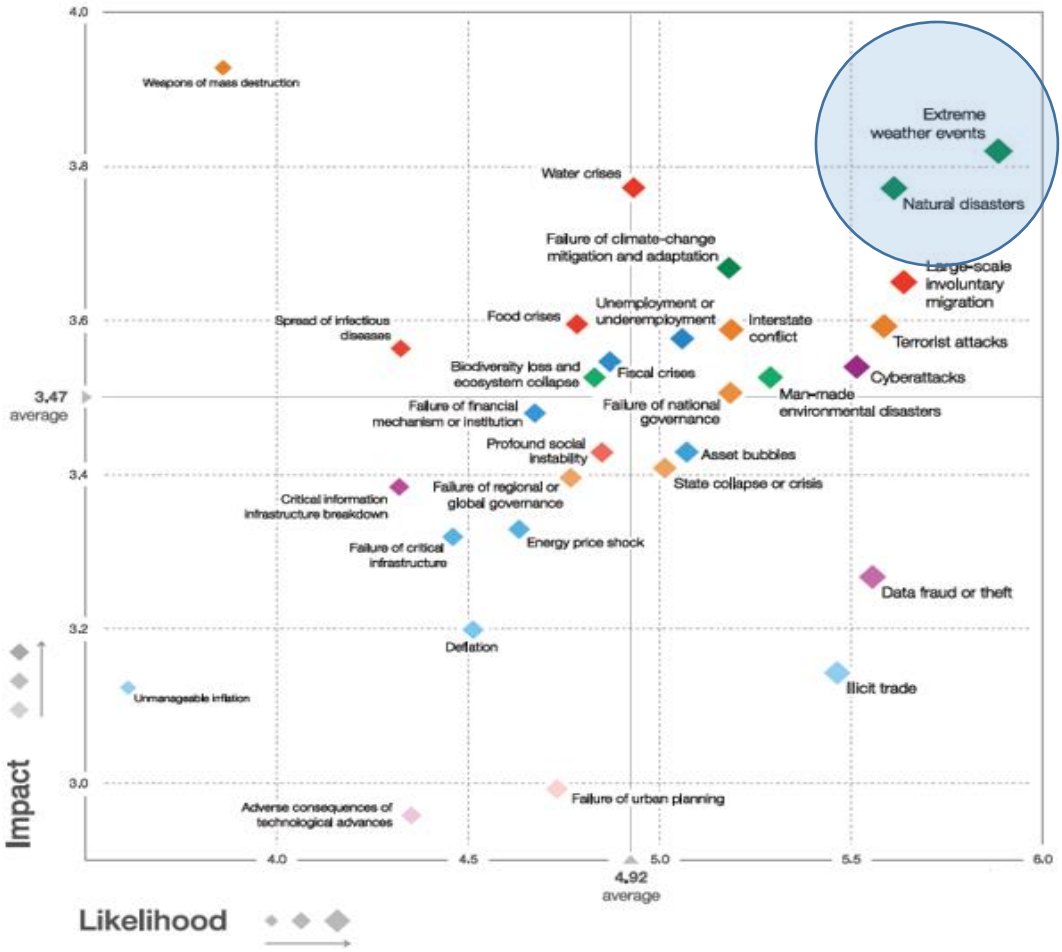

Figure 3: World Economic Forum Global Risks Perception Survey 2017

Weather events pose a significant risk to New Zealand's infrastructure. In some instances, this infrastructure was originally built a hundred years ago to lower threat thresholds and designed to service a smaller population and has been upgraded incrementally. Growth and the demands on a largely fixed system means that many systems are operating almost to capacity on a day-to-day basis (Local Government Infrastructure Efficiency Expert Advisory Group, 2013). The inclusion of extreme weather events - and indeed other disaster events - to an already stressed system poses an increasing challenge to local government decision makers.

The Ministry for the Environment (2016) states that there is a likelihood of increased rainfall along the west coasts of both the North and South Islands through winter and spring, while it gets drier in the east and north. This means that in summer, the east of both islands will likely be wetter, while the west and central North Island becomes drier (White et al., 2017). As a consequence, flood hazards in New Zealand are expected to become both more intense and more frequent (Pachauri et al., 2014).

Two key issues are identified at this point. Firstly, New Zealand's local government-controlled wastewater, storm water and potable water systems are particularly vulnerable to climate change and present a long-term decision-making problem. This problem is based on the difficulties of predicting future impacts, the unknown costs and nature of risk management and choices about the adaption approach most likely to be required and when this should be applied. Secondly, the problems already described are further confounded by population growth and urbanisation, both of which are already taxing a significant proportion of the now inadequately designed and ageing infrastructure system. Even small changes in rainfall extremes, including intensity and duration, can overwhelm the capacity of these systems (White et al., 2017). Aside from the damage sustained from earthquake events, changes in rainfall intensity, drought severity, and coastal inundation will also likely have a direct effect on government owned infrastructure.

Of course, flooding as a result of increased rainfall is only one consideration in climate change. Although this aspect will affect all councils across New Zealand, consideration also needs to be given to other climate change characteristics. This includes the effects on coastal regions through predicted sea level rise.

2.8.1 Sea Level Rise

Sea level rise is considered to be one of the top climate change hazards faced by New Zealand's (Barros et al., 2014). Much of the population and supporting infrastructure is likely to be exposed to the effects of sea level rise: approximately 6.6% of New Zealand's total population and $52 billion of built assets are located within the 0-3m ground elevation zone of mean sea level (Bell et al., 2015). A number of New Zealand's regions are located within these floodplains and highly exposed, including Dunedin, Christchurch, Auckland, Waikato, the Bay of Plenty, Hawke's Bay, and Wellington (Bell et al., 2015).

New Zealand's average sea level rise over the past century is comparable to the average global rate. Projections of global sea level rise are generally accepted (Bell et al., 2015), and expectations from recent analysis found that extreme sea levels which are currently expected to have a 1% Annual Exceedance Probably (AEP) meaning one event will occur every hundred years (or more) (Bell et al., 2015). Unless there is major investment, these extreme events will increase the possibility of

inundation of the infrastructure system which are not designed to cope with these levels (White et al., 2017).

2.8.2 Coastal Storms

New Zealand has become subject to a statistically significant increase in waves during the 1985-2008 period (Fraser et al., 2013). Along with the increased exposure of coastal properties, the risk to associated infrastructure is also augmented. Through sea level rises, the frequency and intensity of coastal storm surges, integral wastewater treatment plants are increasingly at risk of inundation (Kenward et al., 2013).

2.8.3 Extreme Rainfall

Climate changes will also alter precipitation regimes. Although total rainfall has decreased in the north of the North Island, the southwest of the South Island has received an increase (Barros et al., 2014). Much of New Zealand's infrastructure was created in the early twentieth century to meet the stresses of the weather patterns prevalent during that historical timeframe. Flooding brought about through contemporary increases in the intensity of rainfall will influence the operation of infrastructure, notably through overwhelming wastewater and storm water systems. To cite an example of an urban centre, this will likely affect approximately 200 km of pipes in Auckland city (Water New Zealand, 2016). A recent example is the Gore floods of February 2020 where over 1,600mm of rain fell in a 60-hour period (Meteorological Service of New Zealand, 2020). As a result, floodwater inundated large parts of Fiordland, Northern, Central and Eastern Southland and South and West Otago, leading to multiple road closures effectively cutting Gore off for more than 24 hours (Gore District Council, 2020). A state of emergency was declared which required evacuation of local homes. At the time of writing, recovery is not yet complete, and the costs attributed to the event are expected to run into millions of dollars (Gore District Council, 2020). Flooding affected 29 homes in Gore, Mataura, Pukerau and rural areas had water above the floor line with many more having water running underneath them. Eighteen businesses in Gore, Mataura and Pukerau were also affected by flood waters (Gore District Council, 2020).

2.8.4 Drought

Drought also presents significant new risks. It is anticipated that drought may be the climate change impact with the most significant effect on the economy (Westpac, 2018). A recent report by Frame et al. (2018) estimated that the costs from droughts between 2007 and 2017 was $720 million. Drought impacts a wide range of activities including water infrastructure. During a drought scenario, water moving through gravity-fed wastewater systems runs slower, allowing solids to collect in pipes and leading to blockages and potential breaches. Although New Zealand does experience prolonged shortfalls of rain, to date there is no experience of the length of drought required to cause significant impacts. However, with the expected changes in weather patterns, there is the possibility of an increase in drought severity and frequency.

In summary, climate change is already occurring and current projections anticipate that the number and intensity of extreme events will increase in the future. Research connecting climate change to infrastructure risk is scarce, but that which exists does suggest significant impacts, and raises questions about the capacity of the risk management arrangements, particularly at the local government level.

2.9 Summary and Conclusion

A number of themes have emerged from this chapter and can be summarised as follows:

1) Multi-level governance arrangements and decision-making practices are typically designed to provide ‘ground-rules’ for decision-making. They reflect the assumption that decisions are based on information that is reliable and that estimates of the future have certainty. This does not fit well with the changing nature of disaster risk, coupled with probable climate change characteristics. The uncertainty adds complexity (and cost) to decision making and raises questions about the type of governance arrangements that could more effectively guide decision processes.

2) The structure of decision-making frameworks and the capabilities of those within them powerfully shapes risk management decisions. Complexity is thereby added to decision making across multiple structures, as with New Zealand’s government sector, where differing theoretical approaches to risk and risk management are likely present. Diverse perceptions and reasoning of long-term risk by individuals can also influence decision-making. These groups of issues are further compounded by the influence of

two factors; firstly, a current top down approach ending in the local government sector which has a largely uncoordinated approach to networks, and secondly, the issue of time where long-term decisions regarding the protection of infrastructure will be made in a short-term election cycle environment.

In this chapter, the risks to New Zealand government owned underground infrastructure from climate change have been presented. The multi-level governance framework within which risk management decisions are made has also been introduced. Following the risk management failings associated with the Christchurch earthquake series and the related criticism of the 60/40 risk management and the environment in which decision making is made, this analysis has identified a number of problems that this research will address. In summary:

- the number and severity of natural hazard events that will impact upon council owned infrastructure is expected to increase;
- the current risk management arrangements between central and local government were criticised highlighting limitations of knowledge, skillset and lack of foresight in risk management arrangements;
- the governance arrangements may not be well suited to the nature of the problem. Some local agencies operate within localised networks via LASS arrangements to achieve economies of scale for risk financing and the acquirement of knowledge. Otherwise, for the most part, councils are acting and making decisions in isolation.
- In consideration of the evolving hazardscape presented by climate change, in both models of collaborative or isolated decision-making, councils face increasingly critical risk management arrangements that require a long-term adaptive lens.

This points to a very real problem for local government decision makers who carry the responsibility of approving the actions which ultimately secure the future of the three waters infrastructure system. However, to date, there is no evidence that this problem is being addressed in a systematic manner. This context helps provide the broad rationale and set the scene for our research problem. In simple terms this seeks to:

- better understand how the layers of the multi-level governance are linked, and how effective these arrangements are;

- understand the current decision-making practices within the local government environment, how they are coordinated, and how they affect risk management practice; and
- understand the type of problems that they are equipped to deal with, and how they may be appropriate in contributing to forward looking, adaptive solutions.

There is a need, therefore, to explore the conditions that are crucial for effective, future-focussed decision-making within the multi-level governance framework. That is, when and how can actors across a multi-level governance context produce efficient policy and decision-making? Decision-making networks have potential to provide for the dissemination of knowledge and a more appropriate allocation of costs whilst at the same time building resilience and risk management capability in an environment of uncertainty.

Risk in the context of the long-term, adaptive decision making is dynamic and has the potential to create surprises at any given time that are outside the scope of the current financial arrangements and regular coping practices. Thus, there is a strong argument for a revised approach to decision making. The framing of risk within local government's institutional framework practice influences the expectations of central government as a stakeholder. Thus, an interdependency is presented in the shared ability of the institutions to address uncertainty.

The criticisms of the current risk management arrangements indicate an absence of vertical and horizontal collaboration within the multi-level governance framework and as a result the appearance of decision making in isolation at a local government level. Local government carry the expectation of funding 40% of risk management through insurance, for example, for the replacement costs of infrastructure damaged in a disaster event. The network between the two is apparently only realised in such an event and the 60% central government contribution is then enacted. However, in some instances, the 40% expectation has not been met, leaving central government financially exposed. As discussed, additional funding may be problematic along with the dilemma of decisions about values and political interests versus financial prioritisation. This culminates in a vicious cycle of debt being carried by both parties. Local government is reliant on rates contributions and other revenue streams such as development contributions, however if the local agency has a low rate base and/or has

not been identified as a growth area, then additional income may be hard to find. This could suggest that the identified shortfalls are a result of local government decision makers facing a dilemma of uncertainty and using risk management to strike a balance between funding business as usual activities and insuring infrastructure against, say, a 1:10,000-year event.

This chapter has set out the risk environment that New Zealand faces, the problem that this poses for government decision makers; the institutional context within which decisions are made and the relevant literature that foregrounds the analysis and conclusions made later in this thesis. It has also identified two distinct issues that will be used to arrange an analysis of the frameworks, institutional arrangements networks and decision-making adequacy in New Zealand's government environment. That is, in relation to long-term risk management, how this is coordinated, and the local government interpretation of regulations set by central government. Chapter 3 follows with a discussion of the literature reviewed in this research.

Chapter 3 - Risk Management and Decision Making in Uncertain Times

3.1 Introduction

Chapter 2 established a number of key themes associated with problems that link risk management and decision making towards the future protection of infrastructure against climate change effects. The problems include:

- an expectation that the number and severity of natural hazard events are expected to increase;
- the risk management practices currently in place in central and local government have limitations in relation to hazardscape knowledge, skillset and foresight;
- the multi-level, top-down governance arrangements may not be well suited to the nature of the problem and are showing signs of a lack of collaboration and poor coordination.

While a few small collectives of neighbouring councils have formed pockets of localised networks to achieve economies of scale for financing risk management, and enhance the sharing of information and coordination, more commonly, most councils are acting and making decisions in isolation.

Local government responsibility for protecting infrastructural assets is almost exclusively understood in terms of the '60/40' insurance arrangement with central government. These insurance arrangements were tested in the Christchurch City Council experience of managing the response to the 2011 earthquake series and subsequently received criticism as insufficient to meet future needs in anticipation of the effects of climate change. Climate change presents an environment of uncertainty whereby disaster events are expected to increase in both number and intensity, and this presents decision makers across New Zealand's local and central government sector with a number of challenges. It is these conditions that raise the need for closer scrutiny of decision-making under conditions of complexity and uncertainty concerning long term risk management, in situations where there are multiple actors across central and local government. This environment is compounded by tensions between central control, local autonomy and resource constraints.

To provide a conceptual foundation for considering questions relating to governance arrangements, risk management and decision making, this chapter reviews approaches to risk management decision making and the context of questions of time and complexity. The process of defining a problem within an organisational risk management context used here is:

> *through identifying the processes and the elements relevant to that problem, and drawing interactions and boundaries to locate the core of the problem or its true cause (Hua & Bermingham, 2018)*.

Although knowledge about a problem may be available, it may not yet be validated as to the reliability of this information, in that it identifies the fundamental issue, or more importantly, the source of the risk. An example of this is the response to the 2010 Pike River Mine disaster which was hindered by problems which can be traced back to inadequate risk management, planning and testing arrangements (Royal Commission on the Pike River Coal Mine Tragedy, 2012). The 2012 Royal Commission report identified a number of failures including:

- isolated, inflexible decision making by those lacking in necessary technical knowledge;
- transferring of key decisions and judgements away from onsite experts through a lack of poor understanding of roles; and
- slow and inadequate risk assessment processes (Royal Commission on the Pike River Coal Mine Tragedy, 2012).

Like this problem, many risk management studies involve systems with considerable scale and complexity, and/or human factors (Hua & Bermingham, 2018). The first steps in an effective risk management process is to understand the context (Hua & Bermingham, 2018). With regard to the relationships among system components there are issues of time and complexity. Time, in this regard is the consideration of the issue within both short and long-term timescales. Complexity, meanwhile, refers to the description of the risk problem and can be thought of as being on a continuum between simple and complex (Snyder, 2013). ‘Simple’ issues may have numerous components, but the relationships between them are more linear and largely predictable, while complex issues have characteristics which are fundamentally

difficult to model/understand and identify causal relations and hidden effects (Flood & Carson, 1993). With regard to this research, complexity is found in the multiple interdependencies between a wide range of actors, the associated relationships, and/or the other types of interactions between systemic factors and the environment (Yaneer, 2002). Complex systems possess diverse properties that arise from these relationships and influence the capacity to address the emergence and unpredictability of problems (Yaneer, 2002). In these terms, climate change and the associated increases in disaster risk presents many new complexities in decision making for risk management.

This chapter will thus review aspects of risk management and decision making and the potential to provide a basis for a testable framework that can connect better the governance arrangements and decision processes within the context of different dimensions of time and complexity. The discussion that follows in chapter four on modes of governance provides a basis for understanding different approaches to decision making, and how such approaches contribute to - or restrict – decisions for long-term risk management.

3.2 Understanding Risk Management

The discipline of risk management complements the role of government-based decision makers in two important ways. Risk management is recognised as a critical technique in public management (Hampton, 2005), and the emphasis on risk analysis provides a rationale for the inclusion of a wide range of advisors, including administrative officials and external experts, in risk decision processes (Fisher, 2010).

The definition of 'risk' at a policy level, however, is controversial (Fischhoff, 1984). Ewald (2000) states that nothing is a risk in itself, but that anything can be a risk. However, this is wholly dependent on how the potential events are considered and the ensuing danger analysed. In general, the understanding of risk is influenced through developments in the insurance and legal sectors where statistics and probability are used to predict future undesirable events (White, 2015). Socially constructed understandings and terminology such as 'unforeseen events'[6] have been developed to bring meaning to natural events that cannot be reasonably predicted, shifting

[6] Historically known as 'acts of God', but now considered religiously insensitive.

perceptions of accountability from people, governments or economical system towards nature (White, 2015).

The term ‘risk’ has multiple connotations and dimensions in its application to economic, environmental and social issues (Samuels, 2009). These different meanings are often subjective and reflect the interests of particular decision-makers in specific scenarios of uncertainty, such as climate change. As such, no single overarching definition of risk exists (Samuels, 2009). Samuels (2009) further states that individual conceptualisations of risk are regarded as unimportant as long as there is commonality in its management approach and language. In their advisory capacity, risk managers, external consultants and government officials are expected to interpret a variety of evidence relating to economic futures and impact assessments to inform plans and decisions (White, 2019). Numbers provide a ‘technology of trust’ and a rational ‘common language’ to justify decisions (Porter, 1995) and assist in defending potential future legal challenges (Kuhlicke & Demeritt, 2016). In this regard, Jasanoff (2012) describes calculative rubrics, such as risk assessment, as ‘exonerating discourses’, within which the supposedly apolitical realm of rational assessment and prediction provides a degree of political refuge for decision makers.

Nevertheless, it can be contended that reference to risk management is a technique utilised by policy actors and decision makers to enable foresight and the discourse required towards the forming of decisions (Bevir, 2010). These overlaps are important. This is not only because they highlight that risk is a concept relevant to the exercise of policy translation, management and implementation, but also because these overlaps warrant further investigation of the contentious role that knowledge - in particular, quantitative knowledge - plays in decision making at a local government level and between government scales (Fisher, 2012).

The development or design of any information claim involves political choices (Jasanoff, 2012). There are hidden logics that influence which public facts are produced and where reality is bounded by realities of measurement (Denis et al., 2006; Jasanoff & Simmet, 2017). As such, they provide a scientific basis for ordering types of knowledge. Gieryn (1983) used the term ‘boundary work’ to describe ideological attempts to contrast science as a preferred truth over non-science, or to adopt the language of science to legitimate ideological positions all of which can privilege certain

framings and outcomes (Kitchin et al., 2009). There are also the politics of non-knowledge, as scientific practices of ordering and hierarchy mean decision makers can over-rely on what science knows and disregard what science does not yet know (Jasanoff, 2017). Therefore, those disciplines, agencies or issues that have more knowledge resources, calculative competencies or stable roles within decision making may wield greater influence.

3.3 Improving the Current Framework for the Betterment of Long-term Risk Management

To assist, I have drawn on Aven and Krohn's (2013) useful and comprehensive approach on how to understand, assess and manage risk. Essentially, this conceptualisation categorises the principles of the ISO: 31000 risk management standards. The key principles of risk management within the standard are that:

- **Risk management creates and protects value -** This is the contribution of risk management to the demonstrable achievement of objectives and improvement of performance;

- **Risk management is part of decision making** – Risk management helps decision makers make informed choices, prioritise actions and distinguish among alternative courses of action;

- **Risk management explicitly addresses uncertainty** – Risk management explicitly takes account of uncertainty, the nature of that uncertainty, and how it can be addressed;

- **Risk management is based on the best available information** – The inputs to the process of managing risk are based on information sources such as historical data, experience, stakeholder feedback, observation, forecasts and expert judgement. However, decision makers should inform themselves of, and should take into account, any limitations of the data used;

- **Risk management takes human and cultural factors into account** – Risk management recognises the capabilities, perceptions and intentions of external and internal people that can facilitate or hinder achievement of objectives;

- **Risk management is dynamic, iterative and responsive to change** – Risk management continually senses and responds to change. As external and internal events occur, context and knowledge change, monitoring and review of risks take place, new risks emerge, some change and others disappear (Standards New Zealand, 2017).

Dovers and Hezri's (2010) model groups these principles into three distinct factors. The first stage is the precautionary *approach to risk*, based on risk conceptualisation, planning and the associated learnings and advice received in order to understand the risk. The second stage is the *management* and execution of the risk management activities through informed assessment and the controls in place to reduce the likelihood of manifestation, as well as the strategies employed to reduce impacts in the actual event. The final stage relates to the adaptive *future orientation* of these controls and plans and the ability to adapt to the changing environment. The next section will describe the three phases of the model in further detail, and how they may be applied in the context of this research.

3.4 First Phase - Risk Management Approach (Precaution)

Risk is inherently present in all activities and decisions. Essentially, a risk management approach determines the upfront processes, techniques, knowledge, roles and responsibilities required to begin to understand how to manage the dilemma at hand (Lempert & Collins, 2007). These strategies may include risk transfer and risk retention.

Risk transfer

A common example of the transference of risk is passing on the financial risk of a potential problem via insurance. The loss is borne by another party in exchange for a fee that is relative to the replacement value, and likelihood and severity of the risk. This technique is employed by all councils at present for the risk management modelling of their infrastructure. This research and modelling is conducted by insurers based on a council's declared values of age, condition and values (Hamilton City Council, 2015). The extent of infrastructure and, more importantly, the environmental risk hazard profile of the council dictates the cost of this in that a 'higher risk' council can expect to pay more than others and these costs can escalate once a substantial claim is made.

Risk Retention

This is essentially the decision accept and take responsibility for a particular risk. It could be that the risk is expected to happen frequently, but could be considered as have a low severity. This value may fall under the threshold of insurable value, or given the number of low value claims, it would be cheaper to manage internally rather than result in increased insurance premiums as a result of multiple claims. An example of this could be a drought scenario where river levels drop below intake levels and machinery is required to pump water to nearby treatment plants.

3.5 Second Phase - Risk Management

Risk management in its traditional conceptualisation is based on the consideration of a particular event in regards to the likelihood and consequences of its manifestation. In New Zealand, the NZ/AUS ISO 31000 is the recognised risk management model which aims to bring about standardised and consistent risk management practice via normative tools and reporting.

With its origins in economics, Knight (1921) made the useful distinction between 'risk' and 'uncertainty', defining the former as existing where an action can result in different mutually exclusive outcomes where the probability is known, and the latter where the probabilities are unknown. These insights created the fundamentals of risk analysis as a model assessment tool of risk events and exposure, grounded in the need for factual evidence to substantiate and evaluate controls and mitigation (Krimsky & Golding, 2006). Vick (2002) makes a division between 'objective frequency', established through computation, and 'subjective beliefs' based on expert judgement. Historically, risk analysis focussed on the former, while undervaluing both the reality and power of the latter. This poses important inferences in regards to risk assessments, whereby there is low probability and high consequences, say, of damage in a disaster event. However, Vick's (2002) observation that the appropriateness of risk assessment often rests on which of the two distinctions is fit for purpose. In connection to this research problem and the literature reviewed, this observation has consequences for the management of climate change risk. Approaching the problem only by an 'objective frequency' seeking certainty will only partially address the significant element of uncertainty that accompanies change over long timeframes.

Aven and Krohn (2013) offer pragmatic examples of how risk management principles can be employed and point to the need for good risk decision making through building flexibility into resolutions that enable future orientated adaptive - rather than reactive - measures. This relates to the way that risk is conceptualised, understood, assessed, and managed. Aven and Krohn argue that,

> The common procedure of making judgements about the acceptability of risk on the basis of probabilities alone should be avoided. Important aspects of risk can be concealed in the numbers, and a direct comparison of assigned probabilities with numerical criteria could seriously misguide decision makers. (Aven & Krohn, 2013).

This speaks to the issue of the need to see beyond probability measures when developing risk-reducing measures and look for deeper understandings of risk. From a professional risk management perspective, current risk analysis within government grey literature is, to a large extent, centred on probability estimates. Aven and Krohn (2013) argument implies a need to acknowledge and give weight to uncertainties, and adopt a more cautionary stance.

3.6 Third Phase - Adaptive Risk Management

The aim of adaptive management is to focus on learning incrementally to inform future actions. The concept of adaptive management has for some time informed discussions in ecosystem management, its functioning and its structural change (Holling, 1978). The fundamental supposition is that there can only be limited ability to forecast the future behaviour of natural systems, and hence a requirement for adaptive responses that improve practices through experimentation and learning (Pahl-Wostl et al., 2007).

Adaptive management as a concept is utilised in several disciplines which address natural hazards and planning and policy in response to its application for managing uncertainty and change in a climate change context (IPCC, 2014). By nature, adaptive management implies a deliberate action to change operating conditions either in anticipation or at the point when conditions change, and thereby fits well with this research problem, particularly with a future focus.

3.7 Risk Management Decision-making and Uncertainty

Uncertainty is inherent in all undertakings and cannot realistically be avoided. The extent and timeframes under which uncertainty may unfold can sometimes be predicted through investigation influenced by available knowledge. However, it is not always possible to quantify uncertainty. Risk assessment can be used to assist with the effectiveness and extent of current preventative controls and mitigation strategies towards the reduction of impact, as well as determining what new risks could present themselves if such actions are/are not taken. This emphasises the importance of decision-making processes and practices and the role and capacity of those responsible. This commonality also highlights the importance of understanding to what extent decision making about the risks posed by climate change should be conducted in either a networked or isolated environment. Regardless of structure, for risk assessments to be meaningful, a level of understanding or appreciation of the risk in question is required (Fisher, 2012). As discussed in the previous section, the actual effects of future disaster events on infrastructure can remain largely unknown and, when tested, such as in the Canterbury earthquake series, current risk management arrangements found to be inadequate.

Under the '60/40' insurance plan, for example, there is seemingly little need for local government to further elaborate their risk management arrangements – so long as they can meet 40% of the infrastructure value through insurance cover, cash reserves or other means. Assistance from central government can be expected. Yet, in the instance of the Canterbury earthquake series, the shortfall pointed to local government decision makers poorly measuring the risk of unknown costs of a disaster event against the need to finance everyday activities. In the understanding of climate change and the impact it has on different levels of decision-making and policy options, there is a growing recognition that decision makers often rely on intuitive thinking processes rather than undertaking a systematic analysis of options in a deliberative fashion (Kunreuther et al., 2014). Decision making processes often include both deliberative and intuitive thinking. When making risk management and adaptation decisions, decision makers may consider the costs and benefits of alternatives (deliberative thinking). They may also incorporate emotion based on personal past experience, and social and cultural factors (intuitive thinking) (Kunreuther et al., 2014). Given an elected representative's lay, as opposed to expert, approach to climate change risks

and complex uncertainties, this could lead to over or underestimation of risk between councils and central government through the incorporation of scientific data.

There is, therefore, a need for an integrated approach to risk management and decision making at a local government level and between central and local government networks. Integrated risk management refers to the practices and processes involved which, underpinned by a risk-aware culture, contributes to the improvement of decision making and performance through an integrated view of how well an organisation, or in this case connected organisations with the government framework, manages its risks (Kouvelis et al., 2012). Van der Sluijs (2007) describes several approaches to achieving greater levels of integration within a multi-level environment which include risk evaluations based on scientific evidence and the contribution of knowledge from multi-disciplinary panels. Where assumptions and complexity shape the dilemma, the predominant tools used for decision-making are knowledge-based advocacy and considered/ negotiated risk management.

Through the responsibilities articulated in the Local Government Act 2002, a government agency cannot opt to avoid a known risk such as climate change through passing the problem wholly to another party or simply ignoring it. However, under the current insurance arrangements, the risks can be reduced in many situations through research, consultation and the input of external expertise (Mukheibir et al., 2020). This strategy is undoubtedly useful when the dilemma includes uncertainty as to the timing, magnitude and location of a disaster event and an absence of in-house capability.

Uncertainty is described by Funtowicz and Ravetz (1990) as the inclusion of three potentials: the possession of inexact/inadequate information, unreliable data, and/or where ignorance exists. This acknowledges statistical uncertainty, scenario uncertainty and recognised ignorance as opposed to limited knowledge. However, it should be acknowledged that uncertainty is not necessarily always due to an absence of knowledge and, conversely, the acquisition of new information does not always reduce uncertainty (Lawrence, 2016). New information can just as easily raise levels of uncertainty, particularly if it is complex. For the purpose of this research, the term ‘uncertainty’ will take a view that it describes a future state whereby the outcome is unknown.

The pressure on local government decision makers to determine the future in terms of risk management and monetary allocation is significant. Historical data and trends conform to the apparent preference of many decision makers in terms of economic approaches that provide 'law-like regularities' to simplify complexity (O'Neill, 2001). This clear and quantifiable basis on which to base decisions, such as flood management schemes, can be therefore justified and defended. However, recent criticism of this stationarity approach highlights the need for a more science-based approach to decisions (Milly et al., 2015). Stationarity is the understanding, categorisation and prediction of the future behaviour of natural systems, based on an assumption that fluctuations occur within broadly known parameters (Milly et al., 2015). For example, hazards are predicted by insurers based on historical frequency, leading to framings such as a 1-in-a-100-year event probability. Likelihood (based on the past) is then considered against the consequences (based on the present), in order to determine the degree of risk. Confidence in future focussed decision making becomes problematic in that such simplified calculations in the context of climate change, rapid urbanization, and natural and social systems are so dynamic that we should question the extent to which the past is an accurate predictor of future risk (White & Haughton, 2017).

The term 'decision maker' usually describes an individual, however, in the instance of local government (and this research), decision makers are considered to be groups such as elected representative and the committees that they are part of, and politicians at a central government policy level (Kocher & Sutter, 2004). Typically, decision-making is conducted within institutions via prescribed procedures, frameworks which guide the activities of actors within them. Berkhout (2012) regards both the institutional context and the decision actors as pivotal in understanding processes that incorporate perception, evaluation and enactment. There is potential for particular institutional arrangements to contribute to organisational learning and increase the likelihood of anticipatory decision-making responses. Berkhout (2012) further states that the future adaptation of decisions made today hinges on these processes, underpinned by the risk appetite of decision makers and the capacity for organisational change.

Knowledge in response to problems needs to be organised into institutional frameworks before it can be used to enable decisions. Berkhout et al. (2006) emphasised that during organisational learning, the actors that provide advice and

recommendations to decision makers have a tendency to rely on historical events woven into their own experiences over the seeking of new information and, as a result, organisational learning is adjusted accordingly. Learning processes have been described by Argyris and Schön (1978) in their research of single and double-loop learning. This is defined respectively as learning that occurs directly from operating practices that occur without being questioned, and learning that arises from research and critical assessment that lead to informed changes in normative practice, policies and strategic objectives. In regards to the risks associated with climate change, organisational learning is identified as a fundamental way in which institutions can build capacity to undertake informed evaluation of alternative actions, transformative learning and the development of adaptive responses (Pahl-Wostl, 2006). The role of organisational learning in driving institutional change is critical in regard to climate change in order to avoid both 'institutional inflexibility' (Preston, 2013) and path dependency - whereby present decisions are driven by those of the past in tandem with organisational traditions (Næss et al., 2005).

Given the role of local government in its legislated provision and duty of care of (amongst other things) underground infrastructure, the role of elected representatives in representing the values and greater good of their communities is considered key for responding to change (IPCC, 2012). As such, in 2015, New Zealand's government gave its full commitment to adopt and implement the Sendai Framework for Disaster Risk Reduction. The Framework is a 15-year, voluntary, non-binding agreement which tasks the State with the primary role in the reduction of disaster risk, but also acknowledges that the responsibility should be shared with other stakeholders which include local government.

The significance of these networks for decision-making is largely influenced by the locale and its characteristics. For example, the results of the 2019 show that the urban population makes up almost 87% of New Zealand's total population, with the remaining 14% in low density/rural environments (Statistics New Zealand, 2019). Natural hazards such as earthquakes and flooding have significant potential to damage and/or inundate infrastructure affecting essential water supply, wastewater and sewerage systems, affecting, for instance high demand urban areas.

The level of uncertainty around climate change and its contribution to the increase and intensity of natural hazards events should be considered a long-term problem to New Zealand's government. This challenge is considered by the Ministry for the Environment (2021) to be a critical public policy issue that will span at least one generation and will worsen over time. The difficulties of developing effective anticipatory decision-making are further exacerbated through the commitment problems associated with the short-term focus of the local political system (Boston, 2017; Hovi et al., 2009). A short-term focus presents the risk of undermining decision processes concerning the futureproofing of underground infrastructure that require long-term commitments (Auld & Maciver, 2006; Infrastructure New Zealand, 2020; Stafford-Smith et al., 2011).

Three main themes with regard to the governance of risk associated with climate change can be identified. First, by nature, risk is likely to change and evolve over time and the condition of aging infrastructure is likely to worsen in the longer term, particularly in instances of lower levels of attention to future proofing (Burton, 2009). Secondly, particularly from a local government perspective, decision makers are likely to have little-to-no knowledge or experience of long-term risk management, and to perceive the threat as 'distant' and as an unjustifiable expense (Weber, 2006). Finally, if risk management decisions around policy implementation are made too early and over-engineered, or conversely, made too late, the result will likely involve irreversibly increased costs. This process is described by what Tobin (1995) terms the 'levee effect' where increased path-dependency develops. Consequently, exposure increases because the approach taken adopts a singular focus on a sole, high risk area. This effectively puts 'all the eggs in one basket', ultimately reducing the flexibility and capacity to adjust and/or react to changing conditions in other areas without significant reengineering and/or investment.

These collective themes imply the need for an integrated approach to long-term decision making across central and local government that is robust yet flexible and adaptive. This includes recognition of the uncertainty of the future and accepts the continual nature of change. From a governance perspective, the best-case scenario would that the next disaster event happens outside of the current electoral cycle in the distant future, in another location where others will have to make the challenging decisions. The reality is, however, that disaster events could happen anywhere and at

any time. However, the timing of the electoral cycle is only component of the bigger issue. LGNZ's (2013) criticism of the current risk management arrangements highlight a wider multi-level governance context which is characterised by unclear responsibilities, fragmentation and uncertainty. The sum of these components is that decision makers are unable to fulfil the task of risk reduction or reduced financial exposure ahead of the next significant disaster event.

As these decision makers work within the institutional frameworks of central and local government, does this mean that the framework and the complex networks within are aligned and operating effectively? Could these institutional frameworks and networks be positively adjusted to enable better collaboration and decision-making? To answer these questions, some understanding of the role of institutional actors and decision-making is required. The next section will discuss these subjects in order to begin to answer these questions.

3.8 Reflecting upon Risk Management Decision Making in a Multi-Level Context

As previously discussed, a tension within the government framework exists due to its hierarchical structure, which passes on responsibility but without detail on how this should be consistently achieved. This section will allow a better understanding of how networks function and will inform the approach that this research will take.

Can decision makers' better play a role, not as barriers, but enablers of sector-wide, long-term risk management decision making? This question concerns decision making in a multi-level governance context, which includes a network of actors across different levels and organisations. Hertting's (2012) hypothesis is that decision making networks are a product of interactions between actors that invest in cross-institutional arrangements to advance their capacity. The governance of these networks can be complex, and in addition to the challenge of managing relationships across council jurisdictional boundaries, decision making often includes the requirement for information sharing across private sector organizational boundaries (Jacobson, 2016). The nature of networks are, therefore, different from other inter-organisational relationships. Janssen (2010) highlights this as a challenge of both governance and information sharing due to two key differences from inter-organisational governance: 1) the knowledge needed for acquiring, maintaining and using for decision making is often uncoordinated and is distributed across organisations; and 2) information is

constantly changing meaning that investment needs to keep up across the whole network rather than, in this instance, being reliant on one member council. To begin to understand how networks can act as a mechanism for decision-making, two characteristics should be highlighted as to how actors perceive what are known as 'dependency relations'. Analytically, a difference between resource dependencies and dependency relations that produce strategic externalities is useful (Hertting, 2012). Here, the notion of resources and resource exchange is critical. According to organisation theory, specifically inter-organisation theory, all organisations are reliant on certain resources (Burchell & Cook, 2007). Functionally, organisations are thus required to exchange resources in order to achieve their respective goals. For instance, Council A is dependent on council B if A needs a resource that B controls in order to achieve an action. At the same time, if B needs a resource that A controls, then council A and council B are interdependent (Benson, 1982). Not only are such dependencies reliant on resource exchanges, but also the efficiency gains through actor investment in trustful network relations. Decision making networks are thereby organised by the joint interest of safeguarding critical resources in a policy system (Klijn, 2006).

Two points are useful for this thesis. First, from a knowledge base, affordability and consistency perspective, decision-making actors can fully implement their goals on their own, but it is unclear how successful they are until the disaster occurs. Examples of collaboration to date have only been established via LASS structures and these are confined only to some local authorities within the North Island. Second, there is a need to look beyond resources and include strategic externalities to better understand how actors may develop interdependencies. This sits alongside the need to consider how decision makers are structured and how these structures affect the decisions made.

3.9 Decision Making Networks as Continuous Cooperation

The difference between more collaborative, inter-organisational decision-making networks, compared with those maintained internally and in isolation, is the level of cooperation and exchange among actors. While this may occur within a hierarchical context, typically in a top down fashion, a networked approach relies on collaboration becoming a normative working mechanism (Scharpf, 1997). As such, it can be concluded that a networked decision-making approach should not be conceptualised as a distinct and temporary phase or as part of a sequence of sub-networks. Rather, a decision-making network is constantly evolving and adapting to new issues and

knowledge. It is never formed, established or institutionalised once and for all (Hertting, 2012). To work as a collaboration, interdependent actors, therefore, need to continue to establish the network. Actors must demonstrate their recognition of - and identification with - the network while it operates on the levels of policy production and operative actions (O'Toole, 2012).

It has been identified that some local government agencies have developed semi-formal networks within the LASS entity, however, strictly speaking it appears their primary purpose is co-dependency towards the achievement of economies of scale as opposed to the establishment of decision-making networks to manage uncertainty or complexity (LASS, 2018). Nonetheless, the LASS entities are in place with the intention of creating local collaborative networks and this cannot be overlooked as also having some importance to this research.

The chapter will now turn to identifying and examining threats to collaboration within networks to understand how network formation may be problematic or even fail, even though the actors would gain from participating within such arrangements.

3.9.1 The free riding problem

As discussed in Olsen's seminal (1972) research, the free riding problem considers a scenario where everyone would gain from cooperation, but each decision-making actor as an individual would gain even more if everybody but he or she is cooperating. Also defined as a Prisoner's Dilemma, this situation portrays an opportunity in which non-cooperation is a 'better' choice, irrespective of the choices made by the other actors.

A real-world example of the free rider problem involves a strategic situation where all actors will gain from the presence of effective decision-making networks. However, the best situation for every actor is when the other actors of the network are engaged in its establishment, resourcing and maintenance while he or she is enjoying the fruits of the network without contribution. If every actor employs this strategy, the network and associated policy processes are likely to become inefficient, or even ineffectual. Since non-cooperation is often the easiest and, therefore, dominant strategy in Prisoner Dilemma situations, this will usually be the case (Hertting, 2012) and leads to the question of whether this is a relevant analytic model. Could it be possible to benefit from the fruits of decision-making networks without actually being supportive

of them? In consideration of the LASS models, it may seem so. The free riding strategy of this network formation has the potential to see smaller local authorities (or indeed cash strapped large ones) with little or nothing to share, whilst others may communicate somewhat skewed information about their own funded knowledge, perceptions, preferences and potential actions in order to exploit or leverage off the dependency and trust of others within the collective, and thus improve their own position. The problem here is not the lack of information about the perceptions, possibilities and preferences of others. Rather, through informality and a lack of protocols, that no matter how actors may act, non-cooperation will likely be for the betterment of the individual, with mutual non-cooperation becoming the only stable cooperation. Thus, it is not only difficult to establish cooperation, it will also be problematic to maintain it if it is established (Hertting, 2012).

3.9.2 The Assurance Problem

In contrast to the free riding dilemma, the assurance problem describes a situation that threatens collaboration despite a clear interest in cooperative decisions. In this instance, each actor stands to gain if he/she and everybody else in the network work together. This mutual arrangement creates a stable cooperation, but should one actor decide not to collaborate for any reason, such as by withholding knowledge and/or resources, it would be the rational action of the rest to assume the same behaviour (Hertting, 2012). The worst position to occupy is now that of the sole co-operator, who makes genuine attempts to establish and sustain a network while the rest of actors are disengaged. However, if all actors attempt to avoid this sole position and choose not to cooperate, the result will be the failure of the decision-making network.

As an analytic tool, the assurance problem centres our attention on the strategic consequences of uncertainty in what seems to be an idyllic situation (Hertting, 2012). This dilemma is useful in highlighting what can be the result of misinterpretation and lack of knowledge in a network formation. In other words, if knowledge limited decision-making actors lack reliable information about other actor's preferences and desired outcomes, they have little reason to cooperate. That is, while complex interdependencies generate network formation at one level, complexity may prevent the realisation on another (Börzel, 2005).

The dilemma here is not necessarily the disagreement about the need for decision-making networks across institutions, but rather the lack of certainty that network preferences can be transformed into efficient network strategies, with this uncertainty becoming a rationale for non-cooperation.

3.9.3 The Generosity Problem

Finally, the generosity problem refers to a predicament of two different cooperative equilibriums and the conflict between actors over which is preferable. In this dilemma it is not enough that the actors are able to discuss and broker an agreement; not if the difference lays between getting the best and second-best outcome is important to both actors (Hertting, 2012). This highlights the important insight that communication and negotiations are not on their own sufficient to accomplish the common good of a decision-making network. What is also required is generosity. Hertting (2012) states that in order to reach stable cooperation, Actor A must allow Actor B to reach B's most preferred outcome while A accepts a less preferred one, or vice versa.

This analytic model is relevant to this research problem for two reasons. As previously identified in this chapter, at the very heart of networked decision-making is the specific notion of the value of informal relations and trust-invested coordination. The rational actor will sacrifice as much autonomy as is required (and no more) in order to establish a network that will efficiently enable the implementation of their own goals in the face of the perhaps unachievable independent alternative. This assumption again points to the existing collaborative efforts within some of the North Island local authorities, but nevertheless, points out a delicate dilemma for the other, interdependent authorities that are not included; that of the equilibrium between the need of cooperation to improve capacity and the maintenance of autonomy.

3.10 Summary and Conclusion

The above dilemmas describe potentially complex games between actors with a shared preference for coordination. The problem is not necessarily that some actors will seek to ruin decision-making networks through the temptations of the free ride-strategy, nor that, through the shared problem of at-risk infrastructure, the network structure will likely require a significant amount of assurance and harmony between the actors. The problem, then, is to identify the possible institutional solutions that could deliver coordination. In terms of a LASS environment, the arrangement may be

functioning effectively via member contributions, however an overlapping multiple level network is required in order to support the arrangement. For instance, political and financial support is required to realise the value of the network, for members to continue to hold a position within the network, and contribute to the longevity, relevance and effectiveness of the network. Chapter 2 discussed the risk management arrangements and how their testing in the Christchurch Earthquake series received criticism. This chapter has highlighted that the consideration of scale and timing of uncertainty are key contributors to risk management and that an integrated approach to decision making is required between local and central government networks. Aven and Krohn's (2013) approach to understanding, assessing and management of risk categorises the ISO: 31000 Risk Management Standards and that this conceptualisation can be further grouped into three distinct factors – the approach to risk, its management, and its future orientation. A shift, therefore, is required from the current normative practice to include the contribution of knowledge from expertise external from a council to assist in this integrated approach to decision making. The next chapter will discuss modes of governance and how the formation of decision makers influences or constrains the ability to manage the timing and complexity of risk.

Chapter 4 - Modes of Governance for Risk Management

4.1 Introduction

The research question that this thesis seeks to address is to what extent governance arrangements enable effective risk management decisions that protect government owned infrastructure from natural hazards. In order to begin to understand the current decision-making arrangements and the governance structures within which decisions are made, this chapter will review the literature concerning the key modes of governance used within local government and discuss their application, merit and shortcomings. The notion that there are different 'modes of governance' refers to the different fundamental logics which can be recognised in governance practices (Bouwma et al., 2012). Governance as a processes concerns governing, whether by a government, within formal or informal organisations, or through laws, norms, power or language (Bevir, 2013).

The analysis of modes of governance is a reaction to the debates around old public administration and new public management which argue the respective advantages of hierarchies and markets as modes of coordination and governance (Jessop, 2003; Tenbensel, 2005). During the 1980s and early 1990s, this debate evolved from a focus on macro settings to more meso and micro concerns about how to organise, co-ordinate and govern public sectors (Tenbensel, 2005). However, towards the end of the 1990s as new public management reforms were being adopted, the debates about governance and coordination became more multi-faceted as commentators put forward the notions of the existence of alternatives (Tenbensel, 2005).

4.2 Exploring Modes of Governance

The significance of examining modes of governance is that these approaches can then be used as methods by which to begin to understand the complexity of public management practices, which involve combinations and layering of different modes (Tenbensel, 2005). Rhodes (1997) typifies this approach when he asserts that 'it's the mix that matters'. Additionally, when examining different modes and possible mixes, consideration needs to be given to the compatibilities, differences and tensions between them.

Considering modes of governance when thinking about policy and policy-making in a multi-level environment is useful in that it highlights where the policy and decision-

making meet in the effort to match goals and expectations both within and across categories of policy elements (Keohane et al., 1998). This suggests that:

(1) all levels of policy aims, objectives and targets be coherent;

(2) implementation preferences should be consistent; and

(3) within and across levels, policy aims and implementation preferences; policy objectives and policy tools; and policy targets and tool calibrations, also be congruent and convergent (Schneider & Ingram, 1997).

This multi-level analysis assists in explaining some of the complexity and difficulties involved in successful policy design (Bobrow, 2006), while the decisions made at each level provides a useful view of embedded or "nested" relationships (Veggeland, 2008). A nested system in this sense, refers to how the functions such as technical officers and elected decision makers are organised into multiple layers of governance, where the relationship to one another informs and drives the outcomes (Ostrom, 2010).

The literature concerning the modes of governance largely emphasises the realisation that emergent forms of governance remain closely associated with ideals underpinning notions associated with the classical nation state in its claim to protect the collective good in a way that is legitimised by the people, and in a way that remains dependent on 'hierarchical governance'; in this sense, defined as centrally administered coordination (Bouwma et al., 2012). Rhodes (1997) and Kooiman (1993) both agree that emergent modes of governance imply that governments are not now solely accountable for the delivery of collective goods. Thus, new forms of governance have the potential to herald change. Rhodes (1997) and Kooiman (2003) identify these new modes as 'self-governance' and 'network governance'. The collective modes are not necessarily characterised by the lead actor (government, community, for instance), but by the comparative principles that regulate its functioning. Bouwma et al. (2012) state that in principle, every actor can engage in each mode of governance and that in reality the modes are likely realised in a 'fit for purpose' hybrid rather than purist form as a response to an environment which features the complexity/time problem.

4.3 Modes of Governance in Risk Management Decision Making

Chapter 2 highlighted key aspects of the governance of risk management arrangements that have received criticism, such as isolated and inconsistent

approaches to risk management decisions, which have culminated in a shortfall of insurance cover. These issues are good examples of the interaction between issues of time and complexity in risk management. Time, in this instance points to how a focus on short-term cost saving led to under-insurance, and complexity is indicated through poorly informed decision making in the absence of up-to-date knowledge informed by research of the local risk environment. Additionally, time and complexity are likely to be affected by the type of decision-making enabled within the governance arrangements. The multi-level governance arrangements are established nationally by central government, determining the internal and external actors who participate in decision processes. These arrangements determine the level of autonomy afforded to local government, such as in the setting of rates. As such the structure of local government represents a mix or blend of governance modes that includes hierarchy and self-governance. To illustrate this, outside of the pockets of councils under the LASS arrangements, local government risk management decision making largely occurs in a way which is isolated and requires little to no collaboration with other local government agencies or with other external bodies (Local Government New Zealand, 2013).

The widely cited case of the Christchurch City Council and its lack of preparedness for the Christchurch earthquake series, therefore, may be explained by its largely in-house approach to risk decision making. Church et al. (2013), in their analysis of what is required for adaptive risk decisions within the context of climate change, have identified a number of barriers that are relevant to the Christchurch case, and to risk management more generally:

> The first is lack of awareness among key decision makers about climate change and associated environmental sustainability. The second is the inappropriateness of traditional decision-making structures for dealing with both the complexity and pace of climate-driven environmental changes. The third is the short-term views held by many community elected decision makers. (Church et al., 2013, p. 1445).

Avoiding such unpreparedness requires collaborative decision-making that takes advantage of expertise and knowledge, new decision-making structures, and long-term views. Following the Christchurch earthquake series, there were moves to do this

through the establishment of a national decision network to improve and expedite decision making and to reduce uncertainty for residents, businesses, insurers, and other stakeholders (Olshansky & Johnson, 2017).

Recovery authority and policy making was been centralised at the central government level, rather than local government with the intent to strengthen coordination among national agencies and fast track risk management policy processes, concerning government expenditure (Olshansky & Johnson, 2017). However, in hindsight, centralisation has not been effective at facilitating coordination among national, regional, and local levels of government. There is a need to build capacity at the local and regional levels for sustained support of decisions and implementation; and promoting collaboration and empowerment between government and the private sector (Johnson & Mamula-Seadon, 2019).

In consideration of these lessons learned, from an analytical perspective the notion of different governance modes is useful in framing our observations of the decision-making process, and the possibility of identifying areas of weakness along with opportunities for improvement. Broadly speaking, there are four main traditions within government literature that have been drawn on by those who have adopted a multiple modes approach to the study of public policy and management. These are loosely termed as hierarchies, markets, self-governance and networks (Greany & Higham, 2018). What follows is a discussion of these four examples of modes of governance, to highlight how each has different implications for risk management decision-making dependent upon the nature of the problem.

4.3.1 Hierarchical Governance

A hierarchy is essentially a top-down organisational structure within which people and decision makers are ranked in order of importance (Bartolini, 2011). The hierarchical model is less inclusive of other modes of governance such as a network and is a major method of governance, found in many areas of social-political life and is a traditional approach within most organisational management structures. Dahl and Lindblom's (1954) seminal work consider hierarchy as an important form of 'rational social action' and propose that hierarchy is, next to polyarchy (a term the authors use to describe a form of government in which power is invested in multiple people in neither a

dictatorship nor a democracy), is the process in which leaders control non-leaders (Dahl & Lindblom, 1954).

An advantage of a hierarchy is found in the provision of a distinct structure with defined levels of leadership. A characteristic of a hierarchical structure is that it is likely to be organised and stable with decisions made based on the generalist knowledge, supported by the advice and experience of actors. Most importantly, under this structure, goals and objectives are clearly defined (Turnbull, 2012). In this sense, the stability and organisation afforded by hierarchy is capable of responding to more complex problems and risk scenarios. However, in consideration of a government environment where governance actors are likely to change with some regularity as part of the democratic processes, a hierarchical mode of governance is supportive of top-down control over problems identified to be of short term in nature.

A disadvantage of this structure, however, is that top-down decision making may tend to be rigid and dictatorial in nature, and as a result is likely to suppress flexibility and creativity (Kooiman, 2003). Moreover, despite what can result in expedited decision making from concentrated layers of governance, this hierarchical structure is described by Turnbull (2012) as, typically, resistant to inputs from management in decision making. Instead, information is often communicated up to governance committees via high level reports from management which contain recommendations provided to assist in the process of making top down directives, but the actual power in decision making is held by elected representatives and not shared with management. That is, governance may choose not to accept management recommendations (Turnbull, 2012).

While hierarchic governance has received criticism by scholars due to its rigidity and autocratic tendencies (Kooiman, 2003), it is conceded that it is useful in the realisation of collective action for a length of time (Termeer et al., 2013). However, in the context of local government, the resources needed to achieve collective action - money, knowledge, and capability, are spread among many actors, potentially across many councils. Hierarchical governance, therefore, may be difficult for standalone councils when it comes to collective action, for example, in the funding required for environmental risk research. This exercise may be beyond the capacity of a single council with financial commitments to competing priorities, and the in-house

knowledge may lack the necessary expertise required for informed decision making. Recognising these limitations, a hierarchy is regularly replaced or supplemented by network governance (Skelcher, 2007), such as the approach found within a LASS arrangement. Skelcher (2007) identifies a number of incompatibilities of hierarchies in this sense, including;

> The role of elected representatives – politicians are decisive only at crucial junctures as there is a tendency to be unable to accommodate specific complexities,
>
> Accountability – this is secured by governance in their dominant role and is used to control other, lower actors in the decision-making process, and
>
> Decision making – is made in closed networks that lack sufficient expertise and/or steering (Skelcher, 2007).

This way of looking at hierarchy underlines the fact this method of governance presents a 'top-down' character, within which those in governance are, or perhaps see themselves, in some way superimposed above those governed (Kooiman, 2008).

Hierarchical governance as a structural arrangement is the most 'vertical' and formalised of the modes discussed throughout this chapter. Two concepts are important in the discussion of hierarchical modes of governance – steering and control. Steering and control are methods of conceptualising intervention processes, and as such express and cover many societal governing interactions of a top-down nature (Van Buuren & Eshuis, 2010). Although state and hierarchy are not strictly synonymous, the two terms, together with the concept of bureaucracy, are used more or less interchangeably to describe a broad ‘state tradition’ of steering and coordination in the governance debate (Esmark, 2011). Legitimated by elections, government utilises hierarchy in its authority to create a clear division of tasks, rules, rationality and objectivity (Meuleman, 2010).

Steering is a strong metaphor for (public) governing in the traditional sense (Campbell, 2007) and is a daily governing practice in managing societal dynamics. The key element of steering, in whatever context applied, is direction. Direction, therefore, proposes that those in governance, through the interaction with those being governed, have a general notion of where they want to go: a holistic view or image of a future

state that is preferable or more beneficial above the existing one (Cerny, 1994). This direction and steering as a governance activity achieved through goal setting/seeking in a uni-directional, top-down approach (Powell, 1991). However, as with all governing activities, steering is an interactive occupation (Kooiman, 2008), and so goal-seeking may be preferable to goal-setting. Plato (n.d.) describes this environment as being comparable to a well-built ship, whereby navigating the appropriate course is dependent on the interaction between the captain and the crew.

Modern public organisations are complex and diverse and so governance are required to mirror these traits (Kooiman, 2003). In other words, those in control need to have the knowledge to deal with a broad range of complexity. However, just as top-down control is important in governing complex activities, there is also the requirement control over the delivery of other administrative arrangements to ensure the desired outcome. The governance of the achievement of complex operational deliveries through steering is commonly supported by top-down control over bottom-up support and advice (Bouwma et al., 2012), assumes the availability of sufficient 'capacity' for a government to achieve its ambitions allowing a wide range of activities to be delivered. As steering is found to be more political in nature, control can, therefore, be assumed to be more administrative and geared towards the governance of complexity and diversity.

The hierarchy of state governance changes over time with elections and, as such, so does the presiding governance ambition. In these instances, the hierarchy mode will not necessarily change at the top in terms of governance via different people occupying established ministerial position, but the direction and control will shift in consideration of the changing regulatory goals, priorities and aspirations (Bouwma et al., 2012). These new interventions may require new structures of responsibilities and new forms of control and accountability (Kooiman, 2008). According to Majone (1997) the state uses rulemaking as its main instrument to achieve this. The main area of political conflict is identified as review and control of this rulemaking put in place to achieve governance ambitions (Majone, 1997). This process includes an array of contributors including parliamentary committees, government agencies, and subject matter experts and advisors, but throughout the transformation from command to regulation, the state remains the central governing entity (Kooiman, 2008).

4.3.2 Self-Governance

Self-governance is a mode of decision making informed by the principle that ‘societal entities have the capacity to govern themselves autonomously’ (Kooiman, 2003). Self-governance, as a mode of societal governance, is defined as the capacity of societal entities to provide the necessary means to develop and maintain their own identity, and thus show a relatively high degree of social-political autonomy (Kooiman, 2003). This section will consider self-governance from different aspects in the approaches, the method of governance. In self-governance, actors make voluntary agreements (Van Buuren & Eshuis, 2010). Traditionally, this mode is established on the premise that organisations relies on the capacities of actors from the market or society to govern themselves (Van Montfort & Oude Vrielink-Van Heffen, 2006).

Self-governance finds its scholarly genesis in the concept of autopoiesis, literally meaning self-production (Kooiman, 2003). This concept was developed as a method to better understand 'living systems' from a biological perspective, and, as opposed to organs such as lungs, for example, this is more concerned as systems of interactions of components, as living wholes (Mugerauer, 2013). In short, through internal interactions, these systems create their own identity, without dependence on the outside environment, apart from the acquiring of energy and other tangible needs. This describes a system that is autonomous and was adopted by social scientists as an opportunity to draw analogies (By definition an autopoietic system is autonomous). This theory of living autopoietic systems was not only attractive for 'general system theorists', but also for social scientists, who saw all kinds of opportunities for creative analogies (Kickert, 1993; Teubner, 1993).

The scholar who predominantly built the theory of governance around the analogies of autopoiesis was Niklas Luhmann, whose (1974) theories of social systems incorporated the concepts of self-referentiality and communications (as opposed to actors) due to the ability of communication to produce itself, independent of actors. In this approach, systems 'decide' self-referentially what is relevant to them, what conveys meaning to them, and what does not (Kooiman, 2003).

In terms of a mode of governance, self-governance possesses a trait that enables it to be sensitive and responsive to external signals and act as an autopoietic system on its own. This trait is power and by utilising it, the organisation is to act (Luhmann, 1974,

1984). However, given its standalone nature, this means that the organisation does not have a hierarchical position in relation to other, outside organisations (Luhmann, 1984). From a political perspective, this can be problematic, as it requires decision makers to consider communities as a whole (Kooiman, 2008). An observation at this point is that governance and decision making at a local government level is likely incentivised to demonstrate self-governance as a method of gaining a greater voice of self-identity. If a strong self-identity can be established, this may lead to 'tribal' behaviour that becomes more difficult to govern by central government. This means that if services are easy to replace, then this is problematic. Therefore, the self-governing organisation will strive to make this substitution difficult in order to retain power. This 'communitarian' governance builds on the positive involvement of its members in collective matters (Davies et al., 2000). The identity on which the associated governance is founded can be based on geography, culture, ethnicity, gender, sexual orientation or simply a common recreational interest (Tenbensel, 2005). The emphasis, is on community self-governance and the normative literature on this type of governance is closely connected to long-standing themes of subsidiarity and local control over localised problems (Tenbensel, 2005).

An element aligned to this observation of power, is knowledge. If decision makers and management collaborate, governance can become complicated. An example of this is where management unite with fragmented governance in order to pursue their own agenda. In these networks, the distinction of governance becomes difficult to define and have effectively evolved into self-governing units par excellence (Agranoff, 2006). For example, policy reforms in the health care sector. The Allied Health arrangement under the Ministry of Health. Allied health professionals are autonomous practitioners who work in a variety of health care settings and often work in multidisciplinary teams (Ministry of Health, 2020). In this arrangement, individual spheres are broken down so that medical professionals are brought out of their 'silos' and moved towards closer and less hierarchical collaboration with allied health professionals (Kooiman, 2003). This move somewhat retains a self-governance model on the part of the Ministry of Health in that it envelops more people and skills to deliver its services and, as such, retains its power. However, this may be regarded as the incorporation of formal networks to make this happen.

Kooiman, (1993, 2008) espouses that the most spontaneous forms of societal interactions are interferences. Interferences take place within and around 'primary' societal activities such as welfare, care and education, thus self-governance as a mode of governance is entrenched in the sphere of societal interferences. Given that these services lie within the state services, this mode of governance is found less frequently within the market. This creates an environment where actors and governance are involved over time in making and adapting rules regarding the inclusion and exclusion of participants, strategies, and obligations (Ostrom, 2005a).

The advantages of self-governance are, firstly, in respect to New Zealand's environment, it can help solve some problems of the rural community by encouraging grass-root level interaction, which contributes to the strengthening of democracy (Kooiman, 1993). The capacity of a council to focus on its own specific needs can reduce the distraction and onus of responsibility of central government - largely for the betterment of the community. To an extent, this mode of decision making can also motivate the local community to confront and solve their own problems (Kooiman, 2003), reducing dependency on other external agencies and generating confidence among local leaders at a grass-root level. For example, research on active communities in Britain's 'Big Society' discussed an initiative set up in 2010 in order to generate, develop and showcase new ideas "to help people to come together in their neighbourhoods to do good things" (Stevenson, 2020, p. 435). This concerned the attempt to reduce the size of central government and give initiative and responsibility back to local councils to better self-govern and through empowering communities via the following stated priorities:

1. Give communities more powers (localism and devolution)
2. Encourage people to take an active role in their communities (volunteerism)
3. Transfer power from central to local government (Stevenson, 2020)

This focus on self-governing through local communities in shared or common pool resources criticises the idea that a role of government is to prevent 'tragedies of the commons' from happening (Ostrom, 2005b; Termeer et al., 2013).

As such, a disadvantage of self-governance is that, not only does it fail to address cross-boundary, even national problems, but it leaves the more vulnerable or less resourced unable to invest in the knowledge and risk management, for example, to

protect what it values. For this reason, with a purely local focus, this mode is criticised in that it incites regionalism (Jacobs, 2011) whereby organisations can become so embroiled in the solution to their own problem that they are unable to appreciate the state or scope of widespread and/or national problems. This mode of governance is seen within local government in its autonomous approach to decision making. As previously discussed, this is evidenced in the many councils that are not part of a LASS collective and managing their own risks through the procurement of its own insurance cover.

In summary, self-governance provides the opportunity for an organisation to empower itself to focus on its own problems without the need to necessarily consider by the wider environment. However, the challenge of this mode is that in order to achieve this autonomy, this can place limitations on resources and expertise. Many contemporary models of governance systems have been overly simplified and have led to recommendations of policies that have not solved many long-term problems of complex systems (Ostrom, 2010).

4.3.3 Market-Based Governance

Since markets are the primary source of capital, the state both co-creates markets and regulates them (Sbragia, 2000). As investors possess much of the power in determining corporate policy, the system also relies on the capital markets to influence an entity's decision making as to how it is managed and the level of influence held by shareholders (IIED, 2014). The task of financial management concerns the allocation of financial resources and operations within the organisation. These responsibilities range from daily cash management to making long-term financial decisions in support of the operational and strategic decisions (Knott, 2004; Ross et al., 2011). Financial governance requires a thorough understanding, analysis and interpretation of three key financial statements, namely the cash flow statement, the balance sheet and an income statement (Ross et al., 2011).

Corporate governance principles aim at maximising the value of the organisation (Banks, 2004), while capital budgeting principles aim towards the sound corporate financial management required to maximise the value of the firm (Seitz & Ellison, 1999). Both sets of principles of corporate governance are intended at improving the performance and overall responsibility of the organisation towards its stakeholders,

including shareholders (Allen et al., 2009). Thus, capital budgeting, the local or national economy, and corporate governance are interdependent and complement each other.

The ultimate goal of the economy, according to the Organisation for Economic Cooperation and Development (OECD) (2018), is to create an environment of market and business confidence along with the ability to put capital to use for long-term productive investments. The state in Europe and the United States are good examples of 'builders' of markets as well as being the providers of benefits (Le Gales & Harding, 1998). In order to assess whether or not the state is maintaining influence (or even expanding it) vis-à-vis the market, it is necessary to separate the 'state'. At a local and regional level, the market builders may include groups consisting of development agencies such as chambers of commerce, research institutes, universities, and private companies/consultants (Cooke et al., 1997). At a national level, ministries of research, central bankers and finance ministries within the executive and regulatory agencies are among the primary actors shaping the policy discourse and defining the rules. As actors, however, central bankers are certainly representatives of public authority. However, they are not the actors who are central to government led initiatives (Sbragia, 2000).

In the operating environment, due to the separation of management and governance, management may make financial decisions that are not aligned to stakeholder /governance goals and objectives, but rather to maximise what may be deemed to be management's own agenda and/or interests (Kalyebara & Islam, 2014). Expenses known as 'agency costs' arise from this behaviour due to this conflict of interest between governance, shareholders and management. There are decisions that organisations can make in order to force or persuade management to appropriately act in the best interests of the shareholders. These decisions cost money, and they are examples of agency costs. Agency costs are divided into three main categories, bonding costs by the agents, monitoring costs by the principals and residual loss by the shareholders (Deegan, 2009; Jensen & Meckling, 1976).

Agency costs in organisations are commonly found to be high due to governance in control of the organisation making financial decisions outside or over management in order to maximise their own wealth (Kalyebara & Islam, 2014). The high level of

agency costs along with the failure to maximise interests and wealth through poor decision making can easily lead an organisation to bankruptcy. For example, in 2001 in Australia, the collapse of Ansett Airlines was caused by a combination of high agency costs, lack of governance flexibility and management's dissatisfaction in the governance leadership (Easdown & Wilms, 2003).

Capital markets are places or financial institutions where investment securities such as government bonds, corporate debts, shares, derivatives, and mortgages, are bought and sold by businesses, individuals and governments. They include both domestic and international capital markets. Although mostly found in the United States and Europe, this method of governance is also employed within New Zealand. The Local Government Funding Agency (LGFA) sells bonds on behalf of 30 local authorities in New Zealand as a means of fund raising and has a domestic credit rating of AA+, the same rating as the New Zealand government (Local Government Funding Agency, 2015). Established in 2012, the purpose of the arrangement is to reduce local authority borrowing costs and the LGFA is now the second-cheapest lender after the government. The Reserve Bank of Australia sells government bonds, treasury notes and also monitors how other capital market institutions discharge their obligations whilst the Australian Stock Exchange facilitates the selling and buying of shares between the savers and borrowers (Kalyebara & Islam, 2014).

The level of development of the capital markets in the economy is important for the economic growth of a country and, given its mandate, market-based governance is capable of dealing with more complex problems, certainly within those of the finance market. However, a tendency of this mode is towards short termism (IIED, 2014). The reason for this is that, for the benefit of investors, public companies are designed and managed to meet and report on quarterly targets. Companies utilise many techniques intended to boost share prices, however, should they suffer a sharp decline the priority will be for decision makers and management to find a short-term solution.

4.3.4 Network Governance

Network governance refers to decision making through decentralised networks of public and private actors across multiple levels of government. Network governance infers decision making among interdependent, but organisationally separate actors who engage through processes of negotiation. Bevir and Rhodes' (2006) refer to such

governance arrangements as involving decision making within self-organising or inter-organisational networks that coordinate through informal social constructed norms or through formal bureaucratic structures. The term network governance infers the interdependence of multiple actors connected in planning and decision making on issues in modern societies (Edelenbosch & Teisman, 2008). This mode of governance is therefore connected with the theory that multiple actors (and agencies) must work together to achieve common goals.

The study of network governance recognises that policy, defined as the attempt to achieve a desired outcome through decisions, is the result of a process that is subject to negotiations between a wide range of actors (Mayntz, 1993). It recognises the pluricentric nature of decision processes, and coordination through network relationships (Sørensen & Torfing, 2007).

A theoretical framework devised by Pahl-Wostl (2009) addresses the characteristics and capacity of decision making within networks across multi-level learning procedures. The framework makes a distinction between formal and informal institutions, that is, the role of state and non-state actors and the role of hierarchies and networks being the major functions of the governance framework. This division between formal and informal procedures and state and non-state actors conveniently unravels the different positions of actors and institutions that operate in different ways. Pahl-Wostl, Holtz, Kastens, and Knieper (2010) further developed a framework which links organisational management thinking with transitioning to new management regimes. Within this, learning builds decision-making capacity through a shared understanding of rules and practices towards the creation of interdependencies within organisations as an enabler to more flexible decision making. The authors propose that such an approach to decision making and learning may assist institutions move from prediction and control to a more mature approach to risk management in adaptive, integrated regimes that are better suited to address uncertainty.

While the creation of relationships between different levels of government and government agencies is a complex and arduous process (Haas, 1997), the emergence of networked decision making can be considered as an effort to take into account the significance of multiple governance actors towards better institutional coordination (Lederach, 2010). Through this, networks allow for the increased potential of

availability and integration of a range of sources of knowledge and competences to promote individual and collective learning (Haas, 2004). As such, this mode of governance is well suited to risk management challenges such as climate change that are characterised by complexity and long-term uncertainty.

Networks draw on the abilities of actors to combine multiple agendas and responsibilities and to distribute gains (Bouwma et al., 2012). This mode of governance assumes that policies and decisions are created and actioned within the network, informed the principles of trust, reciprocity, collaboration and interdependence. Bevir (2006) describes these qualities as the glue that holds complex networked relationships together. Networks, therefore, develop, evolve and exist through trust and cooperation (Klijn & Teisman, 2003). The actors included in a network represent and contribute a range of interests and insights to problems and contribute towards collectively favoured solutions. Trust is identified as a key characteristic of network co-ordination (Powell, 1991), and is central to achieving cooperation and network longevity.

In a networked mode of governance, public and private actors generally work together in partnership. In relation to this research, private actors could include subject matter experts and consultant who act in advisory capacities in the absence of in-house expertise. At times coalitions can be formed between these groups which are open and easily accessible, but, conversely the groups may be closed and only privy to a small, selected group (Parrilli & Sacchetti, 2008).

The literature further presents a distinction between ‘networks of direction’ and ‘networks of mutual dependence’. In regard to networks of direction, the internal relationships are based on ‘direction and control’, with one central, possibly government, actor being dominant in the network (Parrilli & Sacchetti, 2008). However, networks of mutual dependence are non-hierarchical and characterised by substantial participation in strategic decision making (Parrilli & Sacchetti, 2008). This means that actors make decisions together, grounded in negotiating and common goals. However, decision-making is in itself challenging because networks are often developed in response to the indication that there is no authoritative solution at hand that is acceptable for all the actors involved. The differences in the abilities and behaviours

of the participating actors as well as the potential conflicting interests can contribute to the complexities surrounding networked decision-making.

Explanations of how networks bring about incremental change and routines for policy making tend to address the impact of external rather than internal causes (Marsh & Rhodes, 1992). Policy network analysis, therefore, stresses how networks limit participation in the policy process; decide which issues will be included and excluded from the policy agenda; shape the behaviour of actors through the rules of the game; privilege certain interests; and substitute private government for public accountability (Bevir, 2006). In short, these factors address aspects of stability, privilege and continuity. Bevir (2006) proposes that networks thrive where hierarchies fail, where trust and mutuality characterise the relationships between organisations, where management is by negotiation rather than command and where there is a substantial measurement of agreement on at least the means of policy. Similar to the requirements of anticipatory governance, successful decision making is dependent on having relevant information, skills and resources. In the absence of shared information and resources, the cooperation that defines the particular networks is unlikely to be given readily.

Agranoff (2003) identifies numerous specific conditions by which networks may arise. This includes the reliance on historic local knowledge versus new learnings from external professional expertise and the requirement for cross-sectoral, multi-agency cooperation. However, Agranoff (2003) further states that conflicts between individual and organisational commitments, local and national public expectations, and the flexibility (or inflexibility) of rules are likely conditions by which networks will fail.

The task confronting government is to identify the conditions by which effective networks may thrive and elect the most suitable membership by which to achieve the best outcomes. Salamon (2002) suggests that actors, in moving away from a traditional approach of goal and objective setting by senior management, can achieve this through a hands-off management approach and a focus on persuasion and subsequent agreement of objectives. The small number of LASS arrangements are an example of this in beginning a collaborative approach within the local government sector. The intent of this arrangement is financially driven towards individual councils seeking to leverage economies of scale through group purchasing of insurance to

meet the requirements of the 60/40 arrangements, but without any influence or interference by central government.

As previously stated, the core advantage of networked decision-making is the notion of the value of informal relations and trust-invested coordination. As rational actors will sacrifice some autonomy to promote a network that will enable their own goals in an environment where independence is unlikely to yield opportunity, trust and transparency amongst other networked actors and institutions becomes a useful alternative. However, Klijn and Teisman (2003) take the view that the give and take within a coordinated network presents a complex series of games in which there may be winners and losers. Furthermore, due to the requirement of frequent meetings, this mode of governance can be resource intensive.

Klijn and Teisman (2003) describe network governance as the preferred approach when problems are complex and, furthermore, where the processes are dynamic and perceptions of the problems and solutions may shift over the longer term through the churn of participants and/or where new information emerges. Through the representation of multiple actors with diverse knowledge and skills, this mode has the ability to deal with more difficult dilemmas over extended timeframe risk scenarios and elements of this approach can be seen within the local government LASS arrangements. However, as previously noted, this is confined to a small number of councils, notably Bay of Plenty, Hawkes Bay and Waikato, confining these arrangements only to the North Island. The South Island local government agencies are, therefore, unrepresented in this respect, and instead opt for what has become the traditional self-governance model of decision-making. In terms of local and regional government coordination, it is important to note that some councils have combined the functions. Whilst Hamilton City Council and Waikato Regional Council, for instance, operate as separate organisations, the Nelson/Tasman arrangements have been combined.

The four modes of hierarchical, self, market and network governance have been discussed. Table 2 provides a summary of the findings in terms of their characteristics, advantages and disadvantages.

Table 2. Summary of modes of governance, powers actors and instruments

Mode of governance	Overall governance characteristics	Implementation preference	Effectiveness in decision making over time and complexity
Hierarchical	Top down control	State system macro-level decision making	Effective in more complex scenarios over more shorter timeframes
Self	Isolated control	Micro-level decision making	Generalist expertise allows for more complex scenarios but confined to more short term
Market	Resource/cost efficiency control	Small and medium sized enterprises	Effective in more short term and narrowly focussed scenarios of financial management
Network	Collaboration of actors through the promotion of inter-actor/ organisational activity	Cooperative networks that bridge knowledge/expertise gaps	Effective in more long-term and more complex scenarios

Multiple factors are found to determine the effectiveness of a governance system, with no perfect examples of each mode. The fundamental strengths and effectiveness of each mode is found to lie in the relationships between the layers of governance and administrative officials involved, rather than just one level of government or private ownership. Empirical analysis provides strong support for a polycentric approach towards the considering of the interaction between actors at different levels of governance, and a more nuanced understanding of the factors driving the variation in diverse governance outcomes (Ostrom, 2010).

4.4 Governance and Long-term Decision Making

Having introduced these modes of governance, the chapter now turns to considering governance arrangements and decision practices within contexts of uncertainty or long time scales. Like other countries, New Zealand's three-year electoral system can create political barriers to long-term decision making, leaving little consideration of the

potential effects of damage to infrastructure under natural hazard conditions (Boston, 2016a). The short-term focus promoted by the existing institutional decision-making framework and practices undermines the potential to incorporate a long-term focus on risk and adaptation in decision processes (Klinke & Renn, 2012). This does not have to be the case, however. Anticipatory governance is not a mode of governance in itself, but a practice used to gather information and data in order to assess events or behaviours in a predictable manner (Kitchin, 2014), and allows the utilisation of data as evidence for decision making. To anticipate possible outcomes and make decisions to decrease impact based on the data provided is the crux of risk management (Institute For The Future, 2009). Anticipatory governance therefore encourages decision makers to be forward looking (Feurth & Faber, 2012) and it promotes foresight which, when integrated with policy and feedback, can improve efficiency and knowledge, and allow for flexibility (Feurth & Faber, 2012).

Anticipatory governance is defined as a broad-based capacity extended through society that can act on a variety of inputs to manage emerging knowledge (Guston, 2014). Fuller (2010) further states that practice is both in vogue and effective for the art of foreseeing the spread of an innovation's effects, suggesting that the

> Omnipresence of anticipatory governance is felt in the proliferation of focus groups, consensus conferences, and other interactive media – all of which, again intentionally or not, serve to cast doubts on the representativeness of classic democratic institutions like legislatures and elections (Fuller, 2010).

The genesis of anticipatory governance as a formally recognised practice is found in 2001, where two strands of literatures began to emerge: one associated with authors in public administration and management (e.g. Bächler (2001), and a second associated with authors in environmental studies and policy (e.g. Gupta et al. (2010). Influenced by the public administration literature including Lindblom (1959), anticipatory governance has a negative connotation because incrementalists associate anticipation with prediction, which they view as both impossible and undesirable (Guston, 2013). While the environmental studies and policy literature also views prediction unfavourably (e.g. Sarewitz et al. (2000), anticipation is distinguished from prediction and as a result regards anticipatory governance more positively.

Feltmate (1993) and Osborne (2006) view anticipatory government as mostly about 'prevention rather than cure'. In a chapter dedicated entirely to the topic, Osborne (2006) discusses how government can employ foresight and long-term strategic planning to reduce or eliminate negative outcomes based on forecasts rather than actual results, as opposed to maintaining a large bureaucracy to respond to situations that have already turned bad. The examples cited within Osborne's (2006) research are risk management considerations which include fire prevention and environmental protection to support their argument of the need for strategic planning and long-term budgeting. These activities are more predictive than anticipatory in nature due to the need for plans, forecasts, budgetary ranges, and the like. However, the authors also endorse the somewhat more anticipatory 'Futures Commissions' (Guston, 2013) in which actors 'analyse trends, develop alternative scenarios of the future, and establish recommendations and goals for the community' (Osborne, 2006).

Boston's (2016b) research on anticipatory governance recognises that the past may provide little guidance to the future in that longstanding trends may cease and gradual adjustments may be superseded by nonlinear changes, as in the case of natural hazards (Boston, 2016b). The goal, therefore, is to consider and entrench the future in the present, thereby minimising the bias toward short-termism that can affect democratic processes (Healy & Malhorta, 2009).

There are many reasons why decision makers may fail to efficiently or effectively address creeping problems. In Boston's (2016b) work on public policy and governance, he asserts that the problem may simply not be identified early enough. Alternatively, that the nature of the risk, its severity and likely outcomes may be poorly communicated to decision makers. These failures may be systemic indications of poor monitoring and controls and inadequate or ambiguous reporting. Another factor is the tendency towards pure time preference (i.e. valuing things in the future less than having the same things today). In other words, the tendency to down play probability and underestimate future risks, in particular those which may appear to be abstract or not previously experienced. Another significant consideration is the essential principle of governance network relationships is located in the equilibrium of power between the actors (Forrer, 2014). In the situation between New Zealand's central and local government sector, central government holds a significant amount of control,

predominantly concerning the financial aspects. However, in order to find a balance of control, networks are required to strive for consensus in order to preserve the status quo and allow for flexible and balanced decision making (Newig et al., 2010).

Probing into the future in an attempt to predict unexpected events, or 'black swans' (Taleb, 2007), must start on the basis of both realism and humility about what we can reasonably foresee or predict (Boston, 2017). The aforementioned political risk of short-term, inadequate foresight by decision makers coincides with the criticism of the 60/40 financial assistance arrangements which states that local government is already failing to give proper attention to 'readily detectable threats' (Local Government New Zealand, 2013). In contrast, central government may be equally slow in adjusting their regulatory policies to reflect changing conditions (Boston, 2017). This may be as a result of the restrictive parameters of self-governance whereby local government agencies fail to exercise proper foresight of what has become a national pattern of limited anticipation of problems, consideration of policy responses, and adjustment of policy settings to reflect evolving risk assessments and other changing circumstances (Boston, 2017).

To revise the previously discussed modes of governance in their ability to deal with the dilemmas of time and complexity, the current arrangements and practices within government may be accused of being largely concerned with short term, simple problems. There are of course some instances of complex decision-making, but in order to begin to deal with the issues of climate change, the identified gap in long term, complex risk management must be acknowledged and bridged. In short, an integrated consideration of risk - especially systemic risks over extended timeframes - develops the capability and tools for long term, rigorous risk management (Boston, 2016a) and could add value to the gap present in government's decision-making framework as it applies to long term, complex dilemmas.

4.5 Bridging the Gap of Long-Term Complexity

'Creeping' risks such as climate change are an example of scenarios that are likely to be overlooked or poorly addressed by government. Olson (2016) describes these as problems that tend to grow gradually, sometimes imperceptibly, over considerable time between cause and effect. They often lack vivid or obvious early warning signals which can serve to raise awareness, thereby prompting, in this case, government to

respond (Olson, 2016). As a result, creeping problems often receive much less attention from policymakers than they deserve (Boston, 2016a).

Jacobs (2011) includes the three following reasons why governments may fail to effectively address the timing and complexity of creeping risks. First, the risk may not be identified early enough by the authorities involved. Thinking and working in isolation via a self-governing/hierarchical structure, the problem may be poorly understood and/or communicated to those responsible for taking action. These failures can be attributed to inadequate monitoring and reporting, silo communications between networks and the human propensity to underestimate and downplay risk (Jacobs, 2011).

Second, there is a phenomenon within the governmental system of out of sight, out of mind (Boston, 2017). Decision makers who become distracted by competing priorities within their own role may further confound the thinking around the problem and issues of working in isolation identified by Jacobs (2011). Similarly, through its creeping nature, the absence of clear warning signs of a problem becoming apparent may provide little pressure from the public for the government to take mitigating or early remedial action (Boston, 2016a). Further to this, governments and locally elected representatives may be more concerned about the electoral consequences of poor decisions, particularly those associated with what could be perceived as unnecessary investment or a poor use of expenditure and could therefore be reluctant to initiate mitigating steps. Accordingly, decision makers may react unenthusiastically and prefer to select actions and policies which minimise any short-term political damage (Boston, 2016a).

Third, creeping problems can be cross-boundary. As previously discussed, underground infrastructure will continue across territorial borders and if these junctions are damaged in an event, it will require a coordinated response, often from multiple local government networks (Jacobs, 2011). However, this coordination may be difficult to achieve due to the isolation of self-governing local government departments, distanced hierarchical central government arrangements and the absence of apparent structures - and indeed incentives - to deal with systemic and cross-cutting risks (Boston, 2017).

In summary, forward looking decision making requires those responsible to identify, assess, manage and mitigate multiple risks (Boston, 2017) and in doing so, the bias of the politically unappealing measures required for long-term governance is confronted. Anticipatory governance is characterised by a number of attributes (Barben et al., 2008; Boston, 2017; Guston, 2013). With relevance to a government setting and the objective of a networked approach to decision making and preparedness, these considerations call for forward looking, vigilance, and adaptive qualities.

Forward looking – Risk management is concerned with foresight. There is a requirement to regularly scan the horizon for threats as well as new, unexpected opportunities. Through the assessment of the long-term costs and effects of today's decisions and events, it may be possible to minimise the cost and effect of future harm. Time horizons will always be dependent on the nature of the issue and therefore may consider a few years, decades and potentially, in the case of underground infrastructure, centuries.

Vigilance – Decision makers need to be alert to multiple risks, including those of a systemic nature. This means placing the onus on the proposers of a potentially high-risk decision or policy initiative to demonstrate and/or provide proof that the threat of harm is low and justified (Gee, 2013). In this regard, decision makers are likely to require confident, expert predictions. This is particularly prudent when considering creeping problems and their potential to be overlooked, underestimated and/or ignored. The attempt to identify future threats and design effective responses ahead of an event through, for instance, early warning systems, new scientific evidence and emerging risks allows for testing to ascertain the effectiveness of current institutional and policy controls. Cumulatively, these actions contribute towards rigorous risk management and draw on cognitive biases on risk assessment and decision making (Boston, 2017). Through preparedness and readiness, this allows an ethos of prevention over fix, and proactive measures over remedial action. This 'stitch in time' approach in the evaluation of low-cost measures today seeks to limit or reduce undesirable options in the future. To this end, an Australian study arrived at the similar view that investment in up-to-date scientific research of local hazards is a valuable avenue to provide high-quality evidence that is vital to the advocates of risky decision-making and allows for in-depth, informed decisions (Mukheibir et al., 2013b).

Adaptive – To protect future interests, decision makers seek robust, yet flexible democratic institutions and processes. This is achieved through embracing regular, incremental change and adaptive management (Lawrence, 2016). This requires openness to transformative change and willingness to adjust to new realities as conditions shift beyond the capacities of existing institutions and processes and allows for institutional contingency planning that can accommodate flexible long-term strategies. The adaptive characteristics closely link to this research. Specifically, in the assessment of the arrangements within the government sector towards future orientated risk management.

This discussion of anticipatory governance provides a useful context as to the long-term risk management demands that will likely be placed on decision makers within New Zealand's local government sector over time. Climate change presents significant challenges to the water sector, particularly in respect to uncertainty, and raises questions as to what may be the most appropriate mode of governance in this changing environment.

In summary, a demand for decision makers to be able to address the long-term and complex risk scenarios associated with climate change is now required, but there are questions as to whether the current governance arrangements and decision practices to satisfactorily allow this. From the literature reviewed, the current modes of governance and means of making decisions appear ill-suited to this type of problem. An anticipatory approach to risk management decisions acknowledges the merits of prevention over a cure (Feltmate, 1993) and that foresight, planning and budgeting can enable risk management today to reduce future negative outcomes. Aaron (2000) proposes that the ongoing changes brought about through the effects of climate change can only be partially considered against historical data, and long-standing patterns and trends cease to hold relevance. Decision makers, therefore, cannot rely solely only on locally held performance data or projections. This does not necessarily mean that currently available data lack relevance. Indeed, this data is useful in the real time assessment of whether or not a particular long-term interest is being adequately protected. However, the sharing of data and knowledge through mutual networks such as the LASS arrangements can result in a far greater spread of information on which to base assumptions, as well as the cost saving opportunities of a shared approach to information procurement.

Conversely, Boston (2017) notes that just as decision makers are wary of external risks to the institution, they also face the notable internal risks. Such failure is inherently connected with 'creeping' problems and can take many forms. As opposed to catastrophes that take place rapidly with immediate impacts (such as tsunamis or earthquakes), a different logic is offered when problems and challenges evolve incrementally, and only become visible over long periods (Pierson, 2004). As such, the reference to 'creeping' problems is used to explain the variable adaptation capacities of, in this instance, decision makers, to long-term scenarios of uncertainty. This then leads to questioning the appropriate governance arrangements to provide for effective decision practices to address such problems, how it may be right or wrong and/or how success and failure are derived (Boston, 2017). The probable policy outcome of any of these cases will likely be unsatisfactory and the resources applied to the tackle the problem will likely be used inefficiently or inequitably. The worst-case scenario may result in substantial financial and disastrous physical losses. As the policy failures begin to accumulate in a local or indeed central government environment, so too will the future risk of electoral failure.

4.6 Decision Making in an Environment of Uncertainty

It is acknowledged by scholars that decision making to reduce risk has been slow to develop (Bulkeley & Betsill, 2006; Hallegatte, 2009; IPCC, 2014). The commonly identified reason is the belief that science will offer certainty and the 'answers' will emerge over the course of time. Burton et al. (2002) identified that collective decision-making is key to addressing complexity and that this culture of decision-making will enable decisions to be made based on 'evidence' and institutional frameworks and practices geared to deliver 'certainty'.

Hallegatte's (2009) study of approaches to decision making under uncertainty yielded numerous methods including: the favouring of reversible and flexible options, incorporating safety margins to investments, promoting long-term prospective to soft adaptation strategies and reducing decision time-horizons. These methods are useful, particularly in an insurance/risk transfer perspective, however they do not necessarily have the potential for complex networked decision-making regarding disaster management where uncertainty and change are present. Research on risk governance does seek to fill this gap (Renn, 2008). Risk governance includes and surpasses traditional risk management and assessment. The practice embraces legal,

institutional, social and economic facets of risk evaluation. Further, risk governance also considers the complex networks and relationships between actors, the rules and procedures that govern how risks are framed, and the information collected and analysed which can ultimately influence how management decisions are taken (Renn, 2008). A central component of risk governance is the inclusion of interested parties, which presumably represent diverse values and perceptions, with the intent to influence decisions that fittingly reflect institutional values better than traditional risk considerations (Renn & Schweizer, 2009).

The Society for Decision Making under Deep Uncertainty (DMDU) is a good example of a group that is attempting to improve risk governance and decision making under uncertainty. Lempert's (2019) research approaches the need to understand the organisational, anthropological, political, and ethical implications. Lempert takes the view that the concept of risk governance can have a tendency to adopt a narrow, more technocratic perspective, and identifies the need of a broader context that considers institutions, rules conventions, processes, and mechanisms through which humans acting as individuals and groups make choices affecting risk (Renn, 2008).

Coined as Robust Decision Making (RDM), this is a set of concepts, processes, and enabling tools that are used, not necessarily to make better predictions, but to yield better decisions under conditions of deep uncertainty (Lempert, 2019). RDM combines decision analysis, assumption-based planning, scenarios, and exploratory modelling to stress test strategies over myriad plausible paths into the future, and then to identify policy-relevant scenarios and robust adaptive strategies (Lempert, 2019). Recent work has explored how to embed RDM methods and tools in a risk governance framework (Knopman & Lempert, 2016). RDM is, in summary, a multi-objective, multi-scenario "agree-on-decision" approach (Lempert, 2019) which exploits capabilities and understanding to facilitate deliberative processes in which decision makers explore, frame, and reach consensus on the "wicked" problems that decision makers are set to increasingly face

4.7 Summary and Discussion

The purpose of this chapter has been to introduce the notion of "modes of governance", and four particular modes that are relevant to the management of disaster-related risk in relation to core infrastructure. This chapter has established that problems that relate

to risk management can largely be grouped into four categories: long and short term as the problem relates within time and the focus of decision making, and complex and simple as it relates to the type of problem.

From the studies of governance and uncertainty, three distinct themes have emerged. These themes collectively provide insights which can enable a more integrative approach to decision making across different scales - and indeed government institutions - and have potential to enable robust, networked, anticipatory decision making.

These themes can be summarised as follows:

1. Each mode of governance is characterised by a diverse set of coordinative principles to achieve decisions and outcomes. From the literature, it has been identified that each mode has not only its own strengths and weaknesses, but also dependencies. For example, for network governance to function well it is reliant on actors to be unified in a common goal which is cemented by mutual trust. Conversely, hierarchic governance will likely fail to yield good outcomes in a poorly defined environment where tasks and responsibilities are unclear.

2. The literature concerning approaches to decision making under uncertainty is large. However, for this study an approach that acknowledges legal, institutional, social and economic facets of risk evaluation along with consideration of complex networks and relationships between actors can ultimately positively influence how decisions are taken.

3. An essential component of risk governance is the inclusion of appropriate actors, who presumably understand the diversity of values and perceptions, and who have the intent to influence decisions that fittingly reflect institutional values better than traditional risk considerations which lacks this diversity and is managed at a departmental level and adapted to the achievement of pre-set organisational goals and objectives, budget limitations and the relationship with management.

Modern governmental action is largely formed through bureaucratic structures and, in general, this model is effective in structured situations where problems are able to be framed and directed by single governmental agencies (Forrer, 2014). However, given the complex nature of the risk management of problems associated with climate

change, governance must look to multi-agency solutions that involve a network of policy actors (Forrer, 2014). This approach considers unranked non-hierarchical collaboration rather than traditional government hierarchy, thus requiring a different method of governance (Kee & Newcomer, 2008). As previously discussed, in this arrangement actors are connected through relationships are horizontally grounded in the development of reciprocal trust and mutual accountability. Policy actors must therefore first consider the construction of the problem before deciding on an approach and/or solution.

Four archetypal modes of governance have been discussed within this chapter: hierarchical governance, self-governance, market governance and network governance. These were selected as they are currently practiced within certain levels of New Zealand's government framework and illustrate typical approaches. Each mode is useful, but carries its own advantages and disadvantages in application to dilemmas of time and complexity. Figure 4 provides an overview of how the modes of governance are mapped against problems involving time and complexity and where each is most likely fit for purpose.

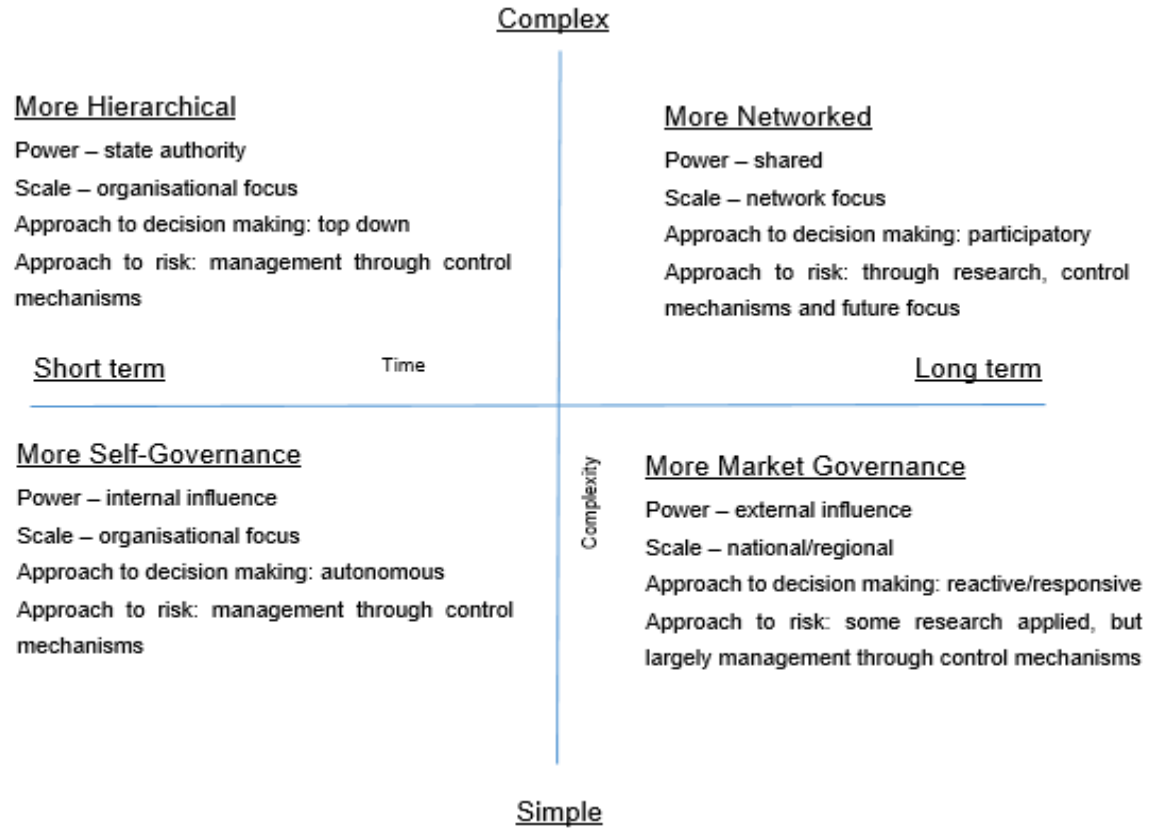

Figure 4: Decision Making Approaches Depending Upon the Nature of Risk

This chapter has highlighted the fundamental need to understand the processes associated with the construction of governance problems and their framing. This includes, but is not limited to definitional struggles, processes of legitimisation, and conditions that promote heuristic and institutional learning. Decision making within this setting must be able be able to identify and tackle the issues associated with long-term uncertainty in a hierarchical framework seemingly designed to accommodate relatively short-term problems. While examining the construction of institutional decision-making arrangements through governance theory is a useful as a lens to underpin this study, it is also important to gain an understanding of the current arrangements from the government actors involved.

In addition, the literature points to the study of decision making under uncertainty as considering three key aspects: which mode are the actors operating within; what is the starting point of the actors in regards to their beliefs; and, the identification of the

interdependencies of relationships and what is exchanged. This further supports the decision to utilise governance theory as an analytical framework by which to explore:

- The context of decision-making within an environment of uncertainty, dynamism, and development;
- How to make decisions within this environment; and
- Understanding the logic that define problems, such as the presence of trust, beliefs, norms, and rationality.

It is considered that these factors are important in not only exploring, but in understanding, the problem of long-term decision making in New Zealand's government networks. Dover and Hezri's (2010) research on climate is important to this enquiry in regards to the likely increased disaster events and subsequent environment of uncertainty. Dover and Hezri also discuss the critical role that institutions play in climate change as far as policy and its application, highlighting that little to no research has been presented regarding the practicalities of government's role at national and local levels. It is observations such as these which support the relevance and need for the research at hand.

4.8 Conclusion

The current arrangements within New Zealand's government framework are found to be piecemeal in nature, largely designed to deal with short term, simple problems. The next disaster event could happen at any time. Having already received criticism for their failure following the Christchurch earthquake series, New Zealand is simply not financially resilient enough to withstand another event of this scale. It is unlikely that the existing decision-making arrangements will be fit for purpose in catering for the long-term complexities of risk management required for the next event. At this stage, it may be prudent to consider that an overall solution to the research problem may not fit entirely within one mode of governance. For instance, a hybrid approach may be key in matching a solution to the problem. Each mode of governance has been found to have positive characteristics and so the type of problem needs to be matched to the type of decision-making arrangement.

In regard to this study, it is becoming clear that a networked governance environment has potential to provide the ability to coordinate decision making under uncertainty across the multi-level framework. Anticipatory governance is identified as a normative

model to strive for in order to achieve the results from this coordination. Chapter 2 has indicated New Zealand's government framework does not operate well in the context of long term, complex problem and decision making. Chapters 3 and 4 have set out a range of the relevant literature that foreshadows the analysis and conclusions which are made later in this research. This review of seminal and recent scholarly literature has informed the development of the three relevant themes above, and these will be used to structure the analysis of long-term risk decision making across New Zealand's government sector, and the framework within which they operate. As discussed in section 3.18, Aven and Krohn's (2013) three-stage model of integrated risk management is identified as a useful tool to guide the analysis as the model essentially categorises key principles of risk management that are found within the ISO:31000:2017 - the precautionary principle, risk management and adaptive management.

Chapter 5 follows with a discussion of the research design and methods employed in this research in order to identify and understand the strengths and weaknesses of the current governance structures as they apply to risk management decision making.

Chapter 5 – Research Design

Chapters 2 and 3 discussed risk associated with climate change relating to the underground water infrastructure, the viability (or otherwise) of the current 60/40 risk management arrangements, and uncertainty caused by the unknown time, location and severity of future significant disaster events. The previous chapter also made the case that decisions made across central and local government with regard to disaster-related risk management of state-owned infrastructure can be understood as being concerned with responding to the dilemmas of time and complexity. Chapter 3 also introduced different governance approaches and reflected on their implications for decision making, and in the process, it proposed a conceptual framework for the assessment of the merits, limitations and feasibility of different approaches to governing for new risks in an environment of uncertainty. This chapter provides an outline of the methods used to analyse the actual governance arrangements and decision practices for long term risk management decision making across New Zealand's three waters. The aim is to understand current practice and, on the basis of that, contribute to the development of a more fit for purpose approach that can better respond to the heightened risk environment and the challenges of climate change.

The nature of the research problem identified thus far involves:

- the need for longer-term consideration of risks to government owned infrastructure as a component of climate change adaptation, but that this presents inherent problems for decision makers;
- the need to understand how governance arrangements and related decision-making processes influence risk management practices;
- and the need to understand the extent to which the current central/local government framework is equipped to support this problem.

5.1 Research Objectives and Method Rationale

In response to the above research problems, and their focus on New Zealand's government sector, the overarching aim of this research is to establish:

To what extent do governance arrangements enable effective risk management decisions that protect government owned infrastructure from natural hazards?

In pursuing this aim, the research has three objectives. Table 2 provides an overview of the objectives of the research along with the methods used to address them. This chapter will expand on each of these in turn.

Table 3: Overview of Objectives and Methods of this Research

	Objective	Method
1	To determine the adequacy of the current governance arrangements and decision-making processes for risk management in New Zealand's national and local government.	Literature/ stakeholder workshop
2	To understand current decision-making practices, how they are established within the governance context, and the implications for risk management.	Literature review/key informant interviews
3	To identify how governance arrangements and decision-making frameworks can be improved to better manage natural hazards.	Key informant interviews/ thematic critical analysis of results/findings to inform and develop an improved model of governance arrangements for risk management

Table 3 outlines how this study seeks to explore the nature and operation of current governance arrangements that govern long-term risk management decision making. In doing so, the aim is understanding the extent to which governance arrangements enable effective risk management decisions that protect government owned

infrastructure from natural hazards. In simple terms, this involves: (1) developing an accurate portrait of the governance arrangements; (2) identifying the key actors within these arrangements and the networks that link these actors within decision-making processes; and (3) understanding the decision-making processes and norms that inform how actors within these networks operate, particularly in relation to risk management decision making. To achieve this, the research draws on theoretical frameworks that provide insights into decision-making processes and the decisions that are made within the networks identified. Uncovering these has potential to identify the way ideas of risk are responded to, and why some courses of action are taken while others are constrained.

As discussed previously, risk management decision making at a local government level often operates in a multilevel governance environment. The mix of qualitative methods described in this chapter are designed to enable an understanding of processes across these levels of government as well as capture distinctive points at a local level. In addition to a review of relevant literature, the data collection process utilised workshops and interviews with a range of key informants involved in central and local government risk management decision making, as well as external professionals who provide advisory services to the sector. These diverse sources of data allowed for the collection of relevant information in context and enabled the investigation of the modes of governance and decision-making within them.

A multimethod approach was applied with data obtained in two distinct phases. The first was a series of key informant workshops which allowed for the collection of information which provided an overview of the key issues within the sector. The workshops also provided an opportunity for key informants to explain the context of some of the challenges within their operating environments. The second (and more extensive) phase of this research was through in-depth qualitative interviews where a cross section of government actors associated with natural hazard-related risk management shared their experiences of decision making.

The interviews provided access to the views of senior administrative officials and risk experts regarding how they operated within existing rules and as they navigated long-term threats in risk management decision making. Their experiences were considered

alongside those of elected representatives who were subject to a difference set of imperatives, motivations, logics and values in risk decision making.

5.2 Methodology and Methods

The research required a broad understanding of structures, operational aspects and privileged knowledge, and a multimethod approach enabled the exploration of diverse perspectives as well as uncovering the structural relationships that are implied in the research questions (Silverman, 2020). It involved interacting with and listening to the voices of research participants in a way that allowed for insights to be drawn from their unique experiences of governance process (Wisdom & Creswell, 2013). The selection of the research methods was informed by the principles set out by Flick (2002, pp. 212-216) who proposed utilising more than one approach to collecting data on the same topic. Doing so was of relevance to this study in that there was a need to capture a range of perspectives across a decision-making network at different levels of government. Additionally, Silverman (2020) states that if the empirical reality under examination has many layers, a multimethod approach is suitable as a way of verifying and validating information and recommends:

- sourcing relevant information
- ensuring participation by a range of suitable actors, and
- establishing the compatibility of data collection and data validation methods.

This follows Heale and Forbes (2015) triangulation model which describes this approach as ‘source’ triangulation between multiple, general types of primary data to validate findings across separate sources.

A multimethod approach also has potential to facilitate greater scholarly interaction as different perspectives are brought to the issues being studied (Wisdom & Creswell, 2013). The use of multiple sources of information, in this instance, recognised the value of individual participant sources in extending knowledge outside that of the literature throughout the research process (Silverman, 2011), and of gaining a far richer set of information than that which may have come from any single approach.

The methodological approach is based in grounded theory which provides a means of developing and testing theory within an inductive framework (Glaser and Strauss (1967). The approach is described as ‘grounded’ because it develops out of, and then

is organised around, an emerging explanation of the data. Myers (1997) states that grounded theory is a "...theory discovery methodology that allows the researcher to develop a theoretical account of the general features of a topic while simultaneously grounding the account in empirical observations or data". Grounded theory is a systematic methodology utilised in the social sciences which involves the construction of theories through methodical gathering and analysis of data (Faggiolani, 2011; Myers, 1997). Research which utilises grounded theory is likely to begin with a question, followed by the collection of qualitative data (Strauss & Corbin, 1994).

The method is one where, as the data is gathered and reviewed, the emergence of repeated ideas, concepts and themes becomes clear, and they are identified and coded. Throughout the process of data collection and review, codes enable data to be grouped into wider concepts and categories which can then be used to begin to answer the research question. As such, grounded theory is somewhat different from the traditional model of research, where the researcher chooses an existing theoretical framework, and only then collects data to show how the theory does or does not apply to the phenomenon under study (Allen, 2008). Grounded theory was identified as an ideal method for this research as it involved interviewing groups of administrative officials, subject matter experts and elected representatives who were able to draw on personal experience and bring diverse views and opinions of the current risk management environment, and reflections on what future adaptive risk management may look like, and how it may be achieved.

The social context of the study refers to the physical and social setting in which people live or in which something happens or develops. It includes the cultures, people and the institutions within which they operate and interact (Casper, 2007). It includes the multitude of activities that occur within a community, and in this case among administrative officials, elected representatives and subject matter experts within central government, and the multiple local and regional government bodies. In the context of this study, this refers to the shared policies and practices that bind the community within the multi-level governance framework.

Critical research recognises that an actor's ability to alter or influence a situation may be inhibited by, for example, institutional norms and rules, policy, and statute. Critical research assumes that social reality is historically constituted and that it is produced

and reproduced by people and institutions (Myers, 1997). The main objective of critical research is one of social critique, within which the restrictive conditions of the current environment are brought to light. Critical research focuses on the oppositions, conflicts and contradictions in contemporary society, and seeks to be emancipatory - i.e., it seeks to eliminate the causes of alienation and domination (Myers, 1997). Grounded theory links to social context and critical research and allows an understanding of the structural and administrative environment, the power and politics in the social reality, allowing the identification of inadequacies that inhibit long term decision making.

The first step involved building an understanding of the current environment via a review of existing research and grey literature. The next phase of data gathering involved interpretive field research. It starts out with the assumption that access to reality (given or socially constructed) is gained only through social constructions such as language, consciousness and shared meanings (Myers, 1997). In general, interpretive research attempts to understand phenomena through the meanings that people assign to them (Walsham, 2006). Interpretive research does not predefine dependent and independent variables, but focuses on the full complexity of human sense making as the situation emerges (Kaplan & Maxwell, 2005). As such, interpretive field research supports the collection of qualitative data via a multimethod approach (Brewer & Hunter, 2006). The adoption of this approach was useful for a number of reasons. Firstly, the scope of data collection included notes made from conversations at conferences and personal correspondence, to audio recordings of semi-structured interviews, to the range of secondary sources found within the literature review. This diverse range of data supports an analysis that includes policy, and the individual accounts of key actor informants. Secondly, due to the limitations of time under which continually moving government research such as this is often carried out, this approach supports a cross-sectional analysis that is useful in providing a ‘snapshot’ of the current arrangements for long term risk decision making.

5.3 Developing the methodology

Having initiated a review of the literature and identifying ways in which the research could be useful in a practical sense, several former colleagues were approached to hold informal conversations to gain a deeper understanding of the social reality within practice and how issues are interpreted differently. These conversations provided a

useful background for the development of early ideas about the existing arrangements along with the formal and informal associated problems.

In the early stages of this study, I attended and gave a presentation at a risk-sector national conference. The presentation focussed on natural hazard risk management, how the 60/40 arrangement could support future adaptive risk mitigation and asked the question of what policies and support would be required by central government to enable positive outcomes. The presentation resulted in many subsequent discussions with a range of executive managers and risk managers from local and central government who reinforced the growing need for research in this area. The support for the research topic was significant and gave rise to a number of recommendations for further key government and elected representatives to be consulted. The interested actors covered a wide range of both North and South Island councils, crown entities and elected representatives. All contacts were followed up and, although informal, these conversations assisted in the provision of an up-to-date comprehension of the environment within which the research would be commenced. This combination of the described and known operating environment demanded the development of a methodology that considered the practical limitations and realities faced by the decision makers.

This research was delivered in four phases, as described in Table 4:

Table 4: Overview of Research Phases

Phase	Methods employed
1 – Understand the current practice	Review of scholarly literature, analysis of grey literature and policy/legislation
2 – Further articulate and validate the problem	Workshop with local and central government administrative officials, risk professionals and elected representatives
3 – In-depth information gathering	Semi-structured interviews

4 – Stress testing the findings	Final presentation with local and central government administrative officials, risk professionals and elected representatives

5.4 Methodological Challenges

5.4.1 The Problem Definition

The first objective of this research is:

To determine the adequacy of the current governance arrangements and decision-making processes for risk management in New Zealand's national and local government.

The first phase, therefore, was to establish an up-to-date understanding of current practice, ahead of the semi-structured interviews. This encompassed the development of a functional understanding of the current risk management arrangements maintained within local government, specifically in regards to longer term risk management decision making. In addition, it was important to understand the role that central government played in this process, the nature of its interactions with local government, and the core policy statements that set out rules and expectations delineating the differing roles. In order to achieve this, a review of relevant documentation was conducted. More specifically, this involved:

Grey literature: a significant number of government reports have been issued on the topics of risk management and climate change adaption and the increasing environmental risks. The starting point of this was the Local Government New Zealand (2013) report which provided criticism of the 60/40 arrangements. This report provided good background detail to causation and implications of the identified failings in the risk management arrangements which provided a pathway to subsequent environmental reports produced by central government agencies on the increasing hazardscape and costs of natural hazard events. The (2013) LGNZ report established the starting point of both context and direction for the research in terms of at-risk infrastructure and this led to the focus to other sources of grey literature largely through LGNZ Infrastructure NZ and the Climate Change Commission. This allowed for the

generation of knowledge as the types of risk, the framework within which decisions are being made as well as a better understanding of how the government, administrative and risk professional community operated within this framework. The (2013) LGNZ report also provided the starting point as to policies and laws which provide the legislative background against which this research is set.

Analysis of policy and law: An understanding of the problem was established through the grey literature on the risks associated with/the management of government owned literature, initially articulated in the (2013) LGNZ report. This highlighted potential problems across central and local government, predominantly concerning issues of coordination and collaboration within the multi-level governance framework. Raising questions around interpretation of rules and the responsibility and accountability for the delivery of risk management, this led to the review and analysis of policy and law. Law in this respect involved the various acts under which risk management is articulated, for instance the Local Government Act (2002) which sets out the requirements of local government regarding the provision of water services and infrastructure, as well as the supporting rules such as the Disaster Recovery Plan which sets out central government's expectations of the risk management environment under which it should be operated. This in turn led to the review of the RMA and Civil Defence and Emergency Management Act 2002, and ISO: 31000 risk management standards in order to understand how the risks within the Local Government Act 2002 are grounded.

In terms of meeting the first objective of this research, primary consideration was given to the fundamental problem of risk management decision making in terms of the *adequacy* of the current New Zealand framework arrangements. An examination of the framework sourced from documents, reports and journals was the starting point for this part of research process. As previously discussed, the key search items utilised for this purpose were government policy and publications limited to New Zealand based or focused publications over the time span of 2010 to date. There are two reasons for this selection. Firstly, that this date marked the beginning of the Canterbury earthquake series and heralded the identification of the failings of the risk management arrangements and subsequent reporting. Secondly, as well as government documents specifically targeting the area of interest, they are also part of the public domain and therefore readily accessible. This inductive process is a

principal method for the exploration of a research question that sought to identify patterns of relationships or problems in practice, rather than simply the confirmation of a theory (Silverman, 2011).

5.4.2 Objective 2: Understanding current decision-making practices, how they are coordinated, and the implications for risk management.

The analysis of data was critical in addressing this objective, but there was also a need to develop practical parameters for identification of two distinct samples in this research: one being government risk practitioners, executives and key senior informants across local and central government, under the banner of 'administrative officials', the other being elected representatives. Decisions had to be made as to the level of familiarity and understanding of policies in practice by elected representatives, as well as how administrative official's participants in the qualitative element of the research could be established (or refuted) as carrying a bias against elected representatives, and indeed with central government and/or other local agencies. Consequently, the terms 'long term decision making' and 'risk management' have been defined very specifically.

The geographic and professional diversity represented by conference attendees not only provided a starting point for the identification of participants to form the sample group. The range of actors from the conference provided good scales of opinions and insights, but also the opportunity of an engaged, networking environment by which prospective interviewees were identified via a 'snowball' approach (Creswell, 2009). The aim of this being to gain further access to extended networks via the initial respondents who have knowledge of other potential respondents with pertinent experience and insights. This process enables a deeper examination of specific topics as they arise within the context of an ongoing series of interviews across key respondents with specialist knowledge and experience.

5.5 Focussing on the Qualitative Dimension

The objective of the qualitative aspect of this research was primarily to gather data that could provide a voice to some of the realities of the failure to acknowledge the long-term risk management of state-owned infrastructure. The problem that this research is ***to what extent do governance arrangements enable effective risk management decisions that protect government owned infrastructure from***

natural hazards. A key component of this study is the need to explain, better understand, and explore research subjects' opinions, behaviour, practices and experiences. It was identified that interviews would be the most appropriate method by which to gain this information. Interviews are most effective for qualitative research (Myers, 1997) and are designed to collected rich information from a number of people about attributes, behaviour, preferences, feelings, attitudes, opinions, and knowledge (Silverman, 2020).

The main advantages of interviews are:

- they are useful to obtain detailed information from privileged experts about expert knowledge, perceptions and opinions
- they allow more detailed questions to be asked
- they usually achieve a high response rate
- respondents' own words are recorded
- ambiguities can be clarified, and incomplete answers followed up
- interviewees are not influenced by others in the group
- Some interviewees may be less self-conscious in a one-to-one situation. (Silverman, 2020).

The following section will explore these objectives and methods in more depth, but in brief, they consisted of three interlinked stages. The first stage of this research consisted of a review of academic literature, journals and government documents and reports. The purpose of this was to identify data sources that other researchers have used and understand how the context of each work/publication contributed to understanding the research problem being studied and provided the ability to critically evaluate research in the field.

The second stage was a key informant workshop held with risk management practitioners, senior administrative officials and elected representatives of the government sector. By this point, a model was under development with the aim of constructing a guide to decision-making modes of governance as set against the dilemmas of time and complexity, with a view to assisting in matching the type of problem to the mode of governance best suited to deal with it. Held at the national LGNZ national conference, the purpose of this exercise was to build on the findings of

the literature review, begin to understand the adequacies of the current framework and the governance approach to risk management decision making, identify and develop broad areas of concern from an actor perspective, and refine the decision-making model. The model was stress tested at a subsequent international risk management conference held at the Australian/New Zealand Risk Society Conference in Melbourne. Based on industry feedback, further refinements were then made to the model ahead of the data gathering of the third stage of semi-structured interviews. The type and quality of data generated in a workshop is different from the data produced by, say, observations and interviews. A workshop was selected as issues can be presented, experimented with and discussed in a more inclusive and less of a formal environment. Thus, when workshops are applied as part of a research design, the researcher opts for an immersive and collaborative setting where meaning is negotiated, providing the opportunity to identify new factors at play and the relationships between them, which neither the participants nor the researchers may not have been aware of prior to the workshop (Ørngreen & Levinsen, 2017). Given the combination of actors from central government and multiple councils, there was a need to be sensitive towards the different ways that people react to the immersive nature of the exercise as well as any potential (perhaps personal) limitations of collaboration.

5.6 Recruitment of the Sample Group

Access to a range of administrative officials and elected representatives was essential in order to establish a research sample. It was considered that those actors who operate or make decisions in risk, policy, and/or infrastructure environments would typically be best suited to engage as interview candidates. Respondents were initially recruited via their participation in a workshop held at the annual Society of Local Government Management (SOLGM) Risk Management Conference. A workshop environment was considered a useful method for a number of reasons. Primarily because this is a high-profile event and well attended by practitioners within the industry involved in risk management and decision-making and as this is a national event, there was representation across the municipal and rural government agencies at practitioner, senior and elected representative level.

Contact was made with other participants by emailing or calling local government risk managers. This group were accessible largely through the researchers existing networks, and therefore many of being previous colleagues who were happy to liaise

directly with prospective participants within their respective institutions. In total 42 expressions of interest were received and the details of these were maintained on an Excel spreadsheet. Six of those registering interest declined to take part in the study, exclusively due to competing work priorities and pressures. The resultant 36 participated in the interviews with a sample group which included local government risk managers, chief executives, politicians, scientists and local government advisors (see table 5). All 36 participants were interviewed and the decision was made that no further interviews were required as no further new information was being gained.

A recruitment pack was emailed to each participant ahead of the interview which included an information sheet (see appendix B) which was provided ahead of the interview and included further information about the research and interview process. This information was revisited and discussed at the beginning of each interview; however, candidates were encouraged to contact the researcher by phone or email if they had any questions or concerns in the interim. If candidates decided to proceed to the interview phase, they were required to return a signed consent form by email. On receipt, the researcher made contact to arrange an interview a time, venue or communication method that suited them, given that some respondents opted to hold the interview over the phone or via Skype. In the instance that no response had been received from a candidate two weeks after the initial information pack was sent out, a reminder email was sent.

Between March and July 2019, semi-structured interviews were carried out with 36 respondents across local and central government. The participants were almost exclusively present at the workshop and/or presentations and self-selected, providing a broad range of actors and agencies across each part of the multi-level framework. From a local government perspective, this included a nation-wide sample of councils in order to identify differing pressures and perspectives spanning rural to urban, main centre and smaller authorities that represent the North and South islands. In regards to central government representation, a range of participants from agencies close to the research subject self-selected and contributed diversity in opinions through their interaction with local government. This included senior administrative officers from New Zealand Treasury and the Office of the Auditor General and NIWA. Finally, it was felt that a high-level appraisal which encompassed both central and local government may provide some useful and informed insights and a former Prime Minister of New

Zealand was also included in the sample. In both central and government environments, the participants were officers who were close to decision making in terms of areas of responsibility such as oversight of infrastructure and/or reporting to governance, or a decision maker in the form of an elected representative. In order to gain a horizontal view of the operational and strategic aspects of decision making, subject matter experts were also included in the sample group. Risk managers were considered to be an ideal addition to the group as from personal experience, they are usually discharged with the responsibility of managing not only the council's risk portfolio, but also the insurance arrangements and so would be able to provide reliable insights. Finally, independent risk consultants were also interviewed. Again, from personal experience, elected representatives often require advice and opinions that are independent from those given by in-house administrative officials. These advisors included engineering risk consultants and insurance professionals all actively providing advice to local government. Consent to be involved in the research was obtained from the participants at the workshop or conference ahead of the interview process.

Table 5 provides a list of the interviewees:

Table 5: List of Interview Participants

Organisation	Interviewees
New Zealand Treasury	Senior Advisor
N/A	Former Prime Minister
Office of the Auditor General	Senior Advisor
NIWA	Senior Advisor
Wellington City Council	Risk Manager (2) General Manager
Waikato Regional Council	Strategic Risk Advisor
Nelson City Council	Elected representative

	Risk Manager
Hamilton City Council	Elected representative Risk Manager CEO Senior planner General Manager (2)
Auckland Council	Risk Manager (2) Senior Planner Infrastructure Operations Manager
Dunedin Council	General Manager Environment Risk Manager Asset Manager
Other relevant professionals (N.B. companies and names/positions withheld)	Earthquake (2) Insurance Companies (4) Risk Advisor (3) Independent risk consultant (4)

As candidates were almost all self-selected from the workshops and presentations, a range of metro and rural councils are present. However, it is noted that there is an absence of small councils in the sample group. This is either because representatives of these local authorities did not show an interest in contributing to the research or were not present at the workshop or conference events.

5.7 Designing the Interview Schedule

Thirty-six in-depth semi-structured interviews were held throughout 2019, with the length of the interviews varying from 30 minutes to, in some cases, an hour. Interviews concentrated on:

- the current process and modes utilised for long-term risk management decision making across local and central government;
- identification of the problems experienced between actors and decision makers;
- identification of the vertical and horizontal coordination problems experienced across the governance framework, and;
- Improvements that respondents considered could be made and implemented.

The interview schedule was designed through the utilisation of a combination of open and closed questions in order to allow for a range of information to be collected in terms of the respondents' employment position and the extent to their exposure of decision making. Questions were ordered in a sequence that enabled a progressively relaxed rapport throughout the interview so that respondents were comfortable in responding to the researcher's 'probing'.

The strength of unstructured and semi-structured interviews is found in their ability to understand rather than to explain (Fontana & Frey, 2005) which was deemed key for this interpretive research. In order to address the second research question regarding forming an understanding of current decision-making practices, how these are co-ordinated and the implications, detailed expert knowledge was required. Semi-structured interviews allowed an exploration of participant's views and experiences and how these are co-constructed via dialogue (Koro-Ljungberg, 2008). The aim, then, was to comprehend the participant's perspectives and then attempt to explain the meaning of their experiences" (Kvale, 1996).

As a foundation for the semi-structured interviews, several questions were formulated with a view to drawing out relevant insights and understandings from interviewees (see appendix C). These questions were not offered in a pre-set order to allow for flow and the flexibility so that, interesting and important lines of enquiry could be pursued during the interview process (Lindlof & Taylor, 2011). The aim of employing this research

method was to generate depth - as opposed of breadth - of understanding (Lindlof & Taylor, 2011).

The questions were focussed on the present decision-making arrangements and the changes required to improve them going forward. The questions also sought to validate what is already known about the current environment from multiple perspectives across the sector, and were future focused to establish a general supposition as to what forthcoming arrangements could look like from the viewpoint of the actors involved (Rubin & Rubin, 2005). These qualitative interviews were therefore a purposefully guided exchange of views between two people discussing a theme of mutual interest (Kvale, 1996) – myself as the researcher, and the interviewee as a professional with expert knowledge and specialised experience.

5.8 Carrying Out the Interviews

The purpose of the interviews was to record the participants first-hand accounts and insights by which to delve deeper into the problem towards the identification of solutions and potential alternatives. All interviews were carried out by the researcher in accordance with the interview schedule, and before the commencement of each interview the consent form and information sheet were briefly discussed to ensure clarity and provide the opportunity to ask any further questions. This included the ethical practice of reiterating the respondents' right to terminate the interview at any stage, or to withdraw the use of part or all of their data for any reason within two weeks. Consent to create an audio recording of the interview was also sought before any recording commenced. Interviews typically took around one hour.

The interviews were designed to explore the current risk management arrangements employed across the government framework that concern the long-term consideration of the uncertainty and effects of climate change adaption, and to identify the barriers to and enablers of decision making. The semi-structured interview process itself acted as a framework within which the participant talked about their experiences and perspectives. The interviews were digitally recorded with the interviewer probing for points of clarification and elaboration to create further depth where appropriate and to ensure that the conversation remained on the subject of the research questions. The interviewing process ended at the point where no new information relevant to the research was added by the participants (Silverman, 2011). Some notes were taken

during the interview by the researcher, but reflective notes were also made at when it was completed. The notes taken during the meeting included key themes that were increasingly repeated as the interviews continued allowing the identification of new and sub-themes, whilst the reflective notes considered the questions that provided interesting responses and those that perhaps needed to be refined. Third objective Identify how governance arrangements and decision-making frameworks can be improved to better manage long-term climate change risk.

The fourth and final phase was to present the model in another workshop with sector risk professionals and decision makers at the Risk Management Institute of Australasia international conference. This allowed for the final validation of the model to collate and incorporate any further recommendations before its addition to this thesis. Ethics approval was granted by the University of Waikato Ethics Committee ahead of the workshop and interviews in January 2018 to conduct this focus group workshop with participants consisting largely of local government risk management practitioners as well as senior decision makers and elected representatives to appropriately reflect a range of practices. The workshop, held at the annual Society of Local Government Management (SOLGM) summit, focused chiefly on:

- identifying broad areas of concern with regard to current risk management arrangements across local agencies;

- The areas of differences in ideology and practice between local and central government in risk management arrangements; and

- Identification of obstacles to navigating the environment of uncertainty brought about by climate change adaptation.

This event informed the building of a fuller picture of the governance structure and arrangements that exist between central and local government as it applies to this research. Given the large number of participants and the layout of the environment, participants worked in groups to respond to the above three points and present their responses back to the wider group. The groups were given the points via hardcopy and were asked to provide notes on discussion points and ideas. These papers were collected and transcribed to an Excel spreadsheet and the ‘presentations’ were

digitally recorded. Permission was sought ahead of the workshop to record and retain the completed papers.

5.9 Data Analysis

Following the period that respondents could withdraw, recordings of the interviews and workshops were transcribed onto Word documents by the researcher. Respondents were happy to be identified by their position and government position (local or central), but other details such as location, age, gender, and length of time employed within government were protected. Each transcription document subject to a coding scheme based on the themes and observations drawn from the interviews, and within the data it was possible to observe further sub-themes. The organisation of the data in this manner enabled a hierarchical system of classification that resulted in clear themes and sub-themes, and these have been employed as the foundation for the description of results.

Aven and Krohn's (2013) research provides a comprehensive approach to integrated risk management that allows the coding of the findings to be broken into three phases of decision making in a government environment:

- a learning approach to a problem (precautionary principle);
- its control and management (risk management), and;
- The planning and adaption required for long-term uncertainty (adaptive management).

There are two further reasons for this selection. The first is based in the discussion in Chapter 2 around the current environment regarding climate change and the New Zealand government's obligations to manage the risks to infrastructure and the seemingly disjointed approach to decision-making in doing so. Secondly, the findings informed by the literature discussed in Chapter 3 pointed to two key considerations: the environment within which the decision makers operate, i.e. local or central government, along with the subsequent networks and any interdependencies of relationships that develop from this position, for instance within a LASS arrangement or independently within a standalone council. Both of these factors may ultimately have an effect on outcomes for decision making.

These criteria were used for assessing the findings from the literature and interview data in regards to the adequacy of the current framework and risk management decision making practice. Adequacy, as it relates to this research, is assumed as the capability to enable long term, complex risk management decisions as discussed in Chapter 2.

The data was analysed and primarily coded in relation to the general interview questions and workshop themes (approach/ governance mode, scale and timescale of decision making). From there, patterns and themes were identified and defined as to frequency or illustrative qualities - for example, roles and responsibilities, agency, and capability. These thematic groups were drawn from the literature regarding institutional analysis through a lens of risk management. Corresponding with the literature discussed in Chapter 3, these themes were gathered into three categories: risk management; governance/mode; and time/complexity.

Braun and Clarke's (2006, p. 12) thematic approach was adopted for the analysis of the workshop and interview findings. Initially, the data was summarised according to Aven and Krohn's (2013) three-stage model of integrated risk management to structure the interviews (the precautionary principle, risk management, and adaptive management). In order to approach the first objective of the current framework and practices, initial coding categories were created: approach/governance mode, scale, and timescale of decision making. This involved the identification of commonalities from the participant responses, as well as picking out any unique subjects that could potentially highlight useful new insights into current practices. This coded data was then subjected to secondary coding for quotes that identified emerging themes which could be defined and named. The final coded quotations were those that were thematically consistent throughout the interviews. Figure 5 provides a summary of the process.

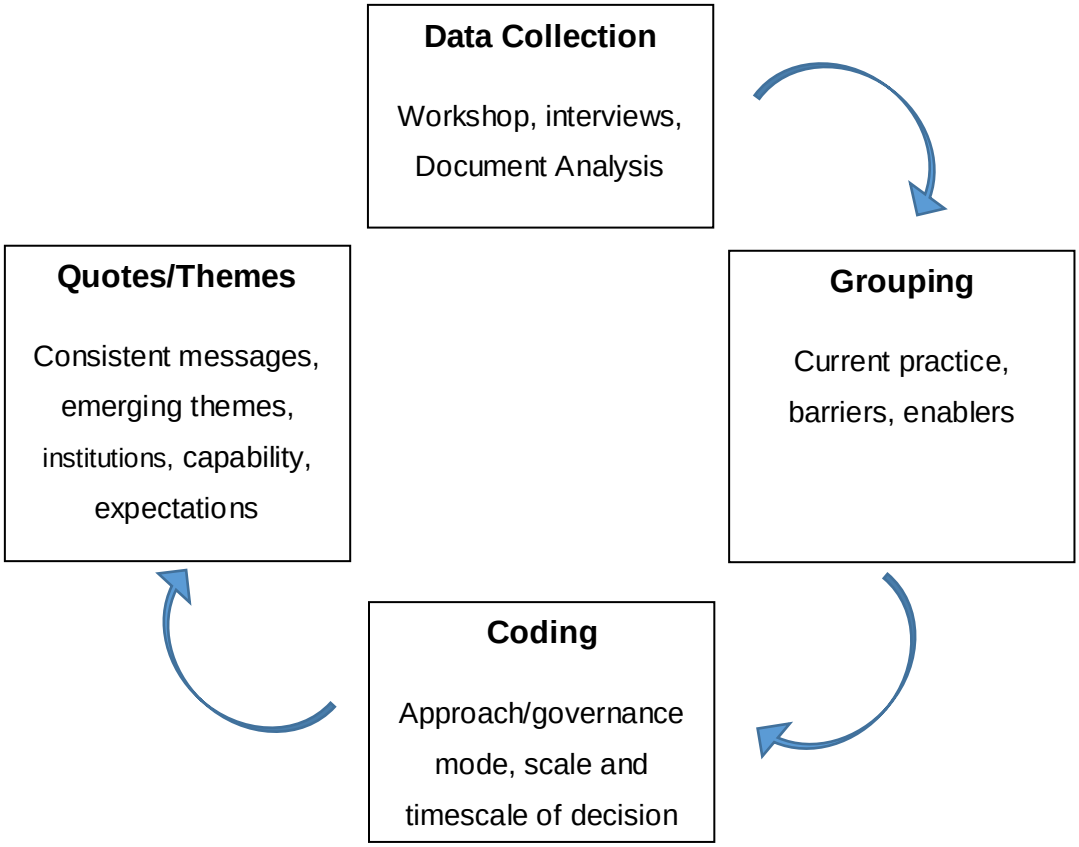

Figure 5: Summary of the Data Collection and Analysis Process .

5.10 Presenting the Results

The results of the survey and interview phases of this research are reported separately in the following chapters of this thesis. The interview findings are presented in a way that is typical of this type of research, and given the range of questions that were explored explore it has been necessary to present the results thematically across chapters 5 through 8. The themes within these aspects have been illustrated through the use of direct quotes from the participants.

In some instances, the quotes selected from the findings are indicative, whilst in other examples a series of quotes from different respondents has been used to affirm a particular point or illustrate different aspects of a similar experience. In this regard it is hoped that the reader obtains an understanding that is consistent with respondents' voiced experiences.

5.11 How governance arrangements and decision-making frameworks can be improved to better manage natural hazards

Enquiry into the adequacy of the current institutional framework and practice of risk management decision making conveniently leads to the question of the scope for improvement. This third research objective formed part of the interaction with participants and the feedback received assisted in the analysis of suitability, and indeed viability, of potential improvements to the current arrangements. These discussions were conducted in two different ways. Firstly, in the early stages of this research, the workshop attended by sector actors was used to test the participant's initial ideas of limitations of the current practice as well as any opportunities for improvement. These suggestions were useful in refining the initial thinking around this research in its early stages as well as laying the foundations for the objectives that it sought to address.

In summary, the design used for the research continually revisits the previously discussed three concepts of integrated risk management (precautionary principle, risk management and adaptive management) and using the findings from the workshops to assess the adequacy of the current framework and the governance approach to risk management decision making. This is summarised below in figure 6. The various reframing's reflected in the data provided an element of internal validation (Silverman, 2011, pp. 367-369) of the effectiveness of the adequacy findings and the suggested opportunities for improvement of the governance modes and ensuing decision-making practice. Such approaches have been found to be useful in research which considers actors with multiple views and beliefs and, therefore, diverse realities, as described by Charmaz (2008).

In order to establish an adequacy criterion from the findings of the workshops, Aven and Krohn's (2013) three-stage model of integrated risk management is central and allows the identification of specific criteria for the assessment of the adequacy of the New Zealand institutional framework and decision-making practice for addressing long-term uncertainty. The criteria are grouped:

1) To understand the current framework, and how the links between central and local government function in its approach to risk management decision making,

2) To understand and assess the current risk management decision making practices within the framework, and the effectiveness of the legislation and rules which binds them,

3) To identify opportunities for positive change towards long-term adaptive governance and decision making.

Understanding and representing uncertainty relates to how such characteristics are reflected in legislation (Chapter 6) and understood and represented in practice (Chapter 7). Relevant criteria includes risk management approach and treatment, the lifetime of decisions, the framing and communication of natural hazard risk, and the consistency and accessibility to up-to-date natural hazard information and research. Decision making relates to whether the elected representatives and can enable long-term consideration of risk and uncertainty and how governance structure can influence practice. The criteria are used against the findings from the literature, and the experiences of local and central government professionals and elected representatives obtained through the workshops and interviews to determine the adequacy of the governance framework and practice in supporting effective long-term decision making to natural hazard risk management.

In summary, the design used for the research iterates between the adequacy criteria developed from the three risk management concepts shown in the centre of Figure 6 and the framework and current practice and their adequacy. These iterations provided an element of internal validation (Silverman, 2011, pp. 367–369) of the efficacy of the adequacy findings and the suggestions for future-orientated improvements in decision-making practice. Iterative approaches of this nature have been found to be useful in research where multiple views and beliefs exist and, hence, different realities, as described by Charmaz (2008). The approach enabled consideration of commonalities between the framework and current practice and provided the ability to identify a number of bounded situations from which to draw out new learning.

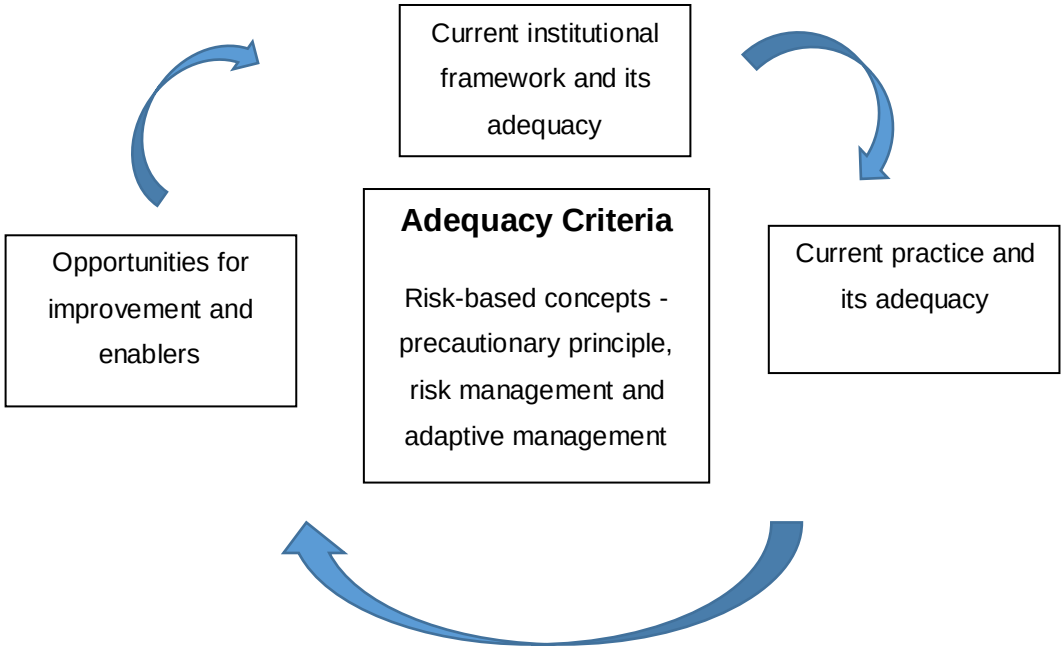

Figure 6: The Research Process

5.12 Limitations of the Research Design

The primary aspect of the research design and its implementation that could be viewed as having limitations Is that the subject matter of this research is relatively complex. As such, there is a risk as to its scope and the potential for a critical element of the problem be missed. This was largely mitigated through focusing the research question specifically on the *adequacy* of the institutional framework and *practice* of risk management decision making. It is acknowledged that there are many social factors which contribute to decision making, however the intent to focus on the composition of governance arrangements enables an in-depth analysis of the current institutional framework and practice. Doing so reveals new insights and makes a contribution to knowledge from an institutional and practice perspective.

5.13 Ethical Considerations

Significant consideration of the ethical implications of this research has been undertaken by the researcher. Ethics approval has been sought throughout the University of Waikato's Division of Arts, Law, Psychology and Social Sciences Human Research Ethics Committee. Ethical considerations also contributed to the recruitment of participants and the nature of the sample. The preservation of respondents' best interests (either organisational or individual) was held as the highest priority in both

the development and delivery of the research activities. Anonymity was therefore assured to all interview respondents on the basis that the details that many of them shared were sensitive in regards to comments on government and elected representatives.

All electronic documents have been securely stored on a password protected file and computer with all hard copy documents held in a locked drawer within the researchers own office at the University. All of this information will eventually be securely destroyed.

5.14 Summary

This chapter has identified the aim and objectives. The phases of data gathering that were employed to achieve this are also described. These phases included semi-structured interviews and workshops with a range of participants from local and central government, and subject matter experts.

A grounded theory was utilised throughout the research process which included data collection and the grouping and coding of findings. To achieve the aim of this research, the findings were considered against an adequacy criterion which was influenced measured against Aven and Krohn's (2013) model of integrated risk to ascertain the effectiveness of the governance framework and risk management practice within. The (2013) approach to integrated risk considered three distinct areas – the cautionary approach to risk, the management of risk and, finally, the future orientated adaptive measures adopted towards risk management. The next chapter will begin to present the findings of the research.

Chapter 6 – The Current Governance Arrangements in terms of the Legislative

6.1 Framework for Risk Management

Following the criticisms made of the local government risk management arrangements outlined in chapter 2, the report by the Office of the Auditor General (2013) described the critical considerations that required embedding into institutional practice in order to enable better decision making to address long-term challenges. These included:

- sustainable service provision based on a long-term strategy;
- decision making informed by risk management;
- better linkages between actors across relevant disciplines and greater consistency in the collection and sharing of data. (Section 4).

The prevailing message throughout the report was the need for local government to continue to provide services in a financially sustainable, yet affordable manner. The issues identified included the risks and challenges likely to be posed by climate change, such as the continued delivery of water services, the availability of water, and the reduction of wastewater. The ongoing performance of the three water systems in response to increases in frequency and intensity of rainfall, and natural hazard events, was also highlighted.

Drawing on the above considerations this chapter addresses objectives 1 and 2, that being to determine and understand current decision-making practices, how they are established within the governance context, and the implications for risk management. Based on insights from the interviews and workshops, the analysis considers the governance framework arrangements in terms of legislation and central government guidance documents, and the way they structure the approach to risk management taken by local government, the day-to-day risk management, and the future orientated adaptive risk management decisions. Chapter 7 will adopt the same approach, but with a focus on assessing the adequacy of current risk management decision-making practice.

6.2 Outlining the governance arrangements for risk management

Chapter 2 introduced components of the government framework as it applies to the governance of risk management and the different responsibilities of central and local government. This section will consider key legislation and central government

guidance documents provided to local government. Aven and Krohen's (2013) three-stage approach to integrated risk management (the precautionary principle approach to risk, the management of risk, and adaptation for future risk management) as discussed in previous chapters, will be used as a framework to inform the observation of how the governance system, key actors, powers and laws are enacted in relation to the three critical considerations provided by the Office of the Auditor General. The broad purpose of this analysis is to gain insights into how governance arrangements intersect with local government long-term risk decision making in an environment of uncertainty.

The NZ government's legislative framework is supported by a number of guidance documents which inform the lines of institutional command in respect of the protocols, roles and responsibilities of central government in the governance hierarchy.

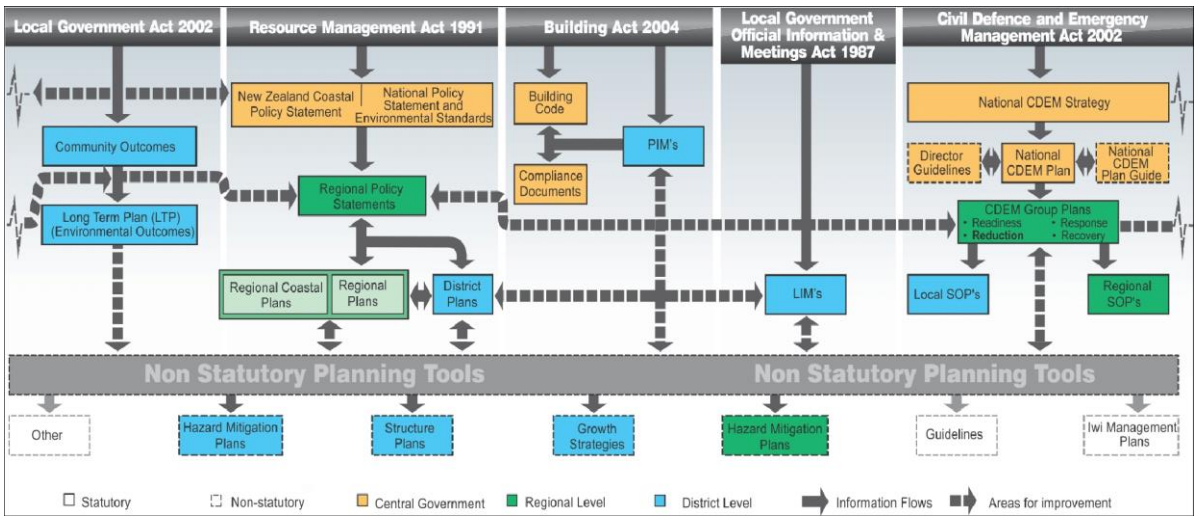

Figure 7. Legislative roles and responsibilities for hazard management in New Zealand

Figure 7 provides an overview of the relevant legislation and plans to this study. Government legislation represents the formal institutionalisation of rules and practices that specify the roles of central, regional and local layers of government in the governance of risk. It is acknowledged that national policy is likely to change in the near future following the RMA review and new developments in relation to climate change legislation, but for the duration of this study, it was this suite of documents that established the protocols, roles and responsibilities for the application of risk management. The discussion that follows will consider how this advice relates to the

precautionary principle, and a risk management and adaptive approach in decision making that considers long-term uncertainty.

Two examples of these guidance documents were analysed, these being the Ministry of the Environment's (2010 and 2017) reports 'Preparing for Flooding' and 'Preparing for Coastal Change'. The coastal change document is, as indicated in Figure 7, focussed on environmental risk management, as is the flood guidance document, although the provisions relating to flood guidance were focussed at a local level. The significance of these documents as examples of policies establishing the approach to risk management was identified by a senior local government planner at a workshop during the data gathering stage of the study. This senior planner commented;

> *"You need to look at these documents when you come to look at the legislation and guidance that comes out of central government – they are a valuable resource to coastal councils."*

The reason the senior planner recommended these was that they illustrated inconsistencies and contradictions in the guidance from central government for the management of risk. The planner added that these particular documents were contradictory and contributed to a confusion in responsibilities for risk, and when asked to elaborate, alluded to conflicting guidance within the plans about the methods by which to inform risk making decision making;

> "You'll see that one tells you that you can base your knowledge and decisions on what you know, like, for example, annual rain patterns and flood events, but the other will tell you that things are changing so much to the point that local knowledge is pretty much redundant. So, what do you do? There is a passage of time between the two documents, but neither has been updated to reflect the other."

These documents are provided by central government to councils to guide risk decision making and they are both of relevant to this study. An analysis on these central government guidance documents will follow along with discussion on the key legislation.

Comments by participants in the workshop and interviews emphasised the importance of three pieces of legislation for long term risk management decision making within

local government as it applies to the protection of government owned infrastructure. The three are: The Resource Management Act 1991, The Local Government Act 2002, and The Civil Defence and Emergency Act 2002. An examination of each piece of legislation will follow in the next section to provide an overview of the content and intent of each Act.

6.2.1 The Local Government Act 2002

The Local Government Act 2002 is the key legislation that establishes the roles, functions and purpose of local government. It also sets out the powers of councils, including the power to make local bylaws, and council planning and accountability requirements.

Local government has a broadly defined set of powers within the Act which empowers a council to “carry on any activity or business, do any act or enter into any transaction” provided that it can demonstrate that the activity or transaction is consistent with the purpose of local government, any other enactment, and the general law (section 12). The purpose of the Act is to provide for democratic and effective local government that recognises the diversity of New Zealand communities, and to that end, the Act:

- states the purpose of local government;
- provides a framework and powers for local authorities to decide which activities they undertake and the manner in which they will undertake them;
- promotes the accountability of local authorities to their communities; and
- provides for local authorities to play a broad role in meeting the current and future needs of their communities for good quality local infrastructure, local public services, and performance of regulatory functions.

The intent of the Local Government Act 2002 is the delivery of current and future services to communities which includes local infrastructure and regulatory functions such as planning and risk management via civil defence and the 60/40 insurance arrangement. The majority of the services encompass the ‘three waters’ (water supply, waste water and storm water) and road infrastructure, which together comprise more than $100 billion of community assets (Office of the Auditor General, 2014).

The strategic management of council's assets and finances is provided via long-term plans which cover a 10-year time span, and by 30-year strategic infrastructure plans. More recently, the subjects of risk and resilience have been identified as key objectives areas of primary focus for local government in line with the National Infrastructure Plan 2011 (New Zealand Government National Infrastructure Unit, 2013).

Central government does not enforce a legislative requirement that local authorities have to formally consult with communities on the planning and funding of activities[7]. Local government is, however, required to:

- enable democratic local decision-making and action by, and on behalf of communities; and
- promote the social, economic, environment and cultural wellbeing of communities in the present and for the future. (Local Government Act 2002, section 10(1)).

The sector is responsible for promoting the 'four well beings' - social, economic, environment and cultural wellbeing - of communities (Department of Internal Affairs, 2017). In relation to the risk management, these dimensions include lifeline infrastructure, and encompass factors that relate to the natural environment to support in a sustainable way the activities that constitute community life, for example, the provision of fresh water. In this respect central government has devolved regulatory powers to local government for matters where it is considered important to allow local or regional communities to decide how rules will be applied locally, or how services are delivered through local democratic decision-making (New Zealand Productivity Commission, 2020).

Despite the responsibilities allocated to local government through the Local Government Act 2002, tensions between councils and central government exist to the point that many local authorities, "see themselves as autonomous bodies and feel that central government agencies sometimes treat local authorities as local offices or branches". (Department of the Prime Minister and Cabinet New Zealand, 2019). A comment made in the workshop by a local government risk professional regarding these tensions provides a council perspective on the devolved responsibilities:

[7] See section 82 of the Local Government Act 2002

"Central government push stuff out and we are left to figure out if and how it works for us. There is no one to ask and no one will call you. We are just left on our own to work it out ourselves really and I honestly think that's a good thing. At least we can get things done our way."

These quotes are important to this research as, if councils are indeed viewing themselves as autonomous, this carries the potential to for localised interpretation of legislation, leading to the risk of more isolated or inconsistent decision making with considerably more variation in how the powers are exercised in each area. Furthermore, the fact that this environment of autonomy is recognised by both central and local government presents a potential issue ultimately in the application and compliance with legislation through the decisions made within local government.

6.2.2 The Resource Management Act 1991

The purpose of this Act is to promote the sustainable management of natural and physical resources. Within the Act, *sustainable management* means managing the use, development, and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic, and cultural well-being and for their health and safety while –

- sustaining the potential of natural and physical resources (excluding minerals) to meet the reasonably foreseeable needs of future generations;
- safeguarding the life-supporting capacity of air, water, soil, and ecosystems; and,
- avoiding, remedying, or mitigating any adverse effects of activities on the environment.

The regional council's mandate of work with communities, iwi and industry to sustainably manage New Zealand's natural resources is linked with their responsibility for making decisions about the effects of land and water use. Sections 33 and 34 of the Resource Management Act 1991 allow for the transfer of powers and delegation of functions (respectively) from central government. In terms of local authorities, section 35(2) (c) requires every council to monitor the exercise of any functions, powers or duties delegated or transferred by it.

Local councils vary considerably in serving populations of very different sizes which may decline or grow at different rates. The age and condition of council's respective infrastructure also differs, along with the availability of financial resources to maintain and safeguard them. As such, autonomous risk management decision making is likely to ensue whereby a council will decide what is best for itself under the powers devolved to it (Department of the Prime Minister and Cabinet New Zealand, 2019).

A focus of the RMA is on managing the known risks of adverse effects of activities on the environment rather than promoting proactive adaptive risk planning (Ministry for the Environment, 2021). However, despite this focus on today's management of risk, the Resource Management Act 1991 been widely criticised for how it has contributed to problematic time delays in reaching decisions between local and central government on plans, and the subsequent high costs associated with the development of infrastructure (LGNZ, 2020b). LGNZ further identify three key issues in relation to the Act beyond the time horizons or risk management decision making, speaking to the tensions between central and local government:

- A lack of effective horizontal and vertical integration between local government and central government and its agencies –overlapping processes for making related decisions create inefficiencies and frustrates local efforts to ensure decisions support objectives;
- Objectives and incentives at different tiers of decision-making – central, regional and local – are often not aligned (LGNZ, 2020b).

Under the current provisions of the Resource Management Act 1991, the Hon David Parker (2021) stated that local councils are struggling to keep pace with population growth, that water quality is deteriorating, and that there is an urgent need to reduce carbon emissions and adapt to climate change. With regard to climate change, the recent Assessment Report of the International Panel on Climate Change (IPCC) provides a clear statement about the degree of which climate change is occurring, and the impact of human activity (IPCC, 2015). This evidence and recent developments, such as the Ministry for Primary Industries' (2021) review of the Emissions Trading Scheme and announcement of the intended nationally determined contribution for reducing greenhouse gases and the more recent review of the Resource Management Act 1991 focussing on the existing weaknesses in the allocation of roles and

responsibilities of local government in mitigating and adapting to climate change 1991 (Ministry for Primary Industries, 2021). The Resource Management Act 1991 and subordinate National Policy Statements articulate that local government's role is fundamentally to assist and support their communities to adapt to the foreseeable effects of changing climate (SOLGM, 2017). This role complements that of central government's, that being to set national targets such as greenhouse gas emissions and develop policies by which to achieve them (SOLGM, 2017). In February 2021, an announcement was made that the Resource Management Act 1991 was identified for repeal and be replaced with new laws (Parker, 2021). The three new Acts were initially announced as the:

Natural and Built Environments Act (NBA) to provide for land use and environmental regulation (this would be the primary replacement for the RMA)

Strategic Planning Act (SPA) to integrate with other legislation relevant to development, and require long-term regional spatial strategies, and

Climate Change Adaptation Act (CAA) to address complex issues associated with managed retreat and funding and financing adaptation[8].

6.2.3 The Civil Defence and Emergency Act 2002

The purpose of this Act, which repeals and replaces the Civil Defence Act 1983, is to:

- improve and promote the sustainable management of hazards (as that term is defined in this Act) in a way that contributes to the social, economic, cultural, and environmental well-being and safety of the public and to the protection of property; and

(i) encourage and enable communities to achieve acceptable levels of risk including, without limitation;
(ii) identifying, assessing, and managing risks; and consulting and communicating about risks;
(iii) identifying and implementing cost-effective risk reduction;
(iv) monitoring and reviewing the process;

[8] The Environment Minister recently announced that the Climate Change Adaption Act will be given a different name.

(v) provide for planning and preparation for emergencies and for response and recovery in the event of an emergency;

(vi) require local authorities to co-ordinate, through regional groups, planning, programmes, and activities related to civil defence emergency management across the areas of reduction, readiness, response, and recovery, and encourage co-operation and joint action within those regional groups;

- provide a basis for the integration of national and local civil defence emergency management planning and activity through the alignment of local planning with a national strategy and national plan; and
- encourage the co-ordination of emergency management, planning, and activities related to civil defence emergency management across the wide range of agencies and organisations preventing or managing emergencies.

The Civil Defence and Emergency Management Act 2002 delivers a national strategy based on the '4Rs' of disaster risk reduction - namely readiness, response, recovery and reduction - which are utilised towards the sustainable management of hazards (New Zealand Government, 2008). The activities outlined within the Act contain a local government focus with co-ordination across local agencies, specifically in connection to the planning of the cross-boundary infrastructure network as it applies to community health/welfare in response to natural hazard event. The intent of the Civil Defence and Emergency Management Act 2002 is to strengthen the legislative framework in order to expedite community recovery after an emergency (Civil Defence New Zealand, 2021a). As discussed in Chapters 1 and 2, Section 33.4.2 the Guide to the National Civil Defence Emergency Management Plan (2015) states that eligible recovery costs are 60 per cent funded by central government, and the remaining 40 per cent funded by the affected local authority (Civil Defence New Zealand, 2021b). A comment made by local government general manger in response to meeting the 40 per cent requirement was:

> "We are a small council, but have the responsibility for quite a large catchment area in terms of infrastructure. Quite frankly, with the existing budget we have available, if we weren't part of a LASS group, I'm not sure we could afford to meet our end of the 60/40".

The comment made regarding the affordability of the requirements of the Civil Defence and Emergency Management Act 2002 is supported by the findings of the 2019 Productivity Commission inquiry into local government funding and financing found that there are areas of significant funding pressure. These pressures are highly uneven across councils with small, rural councils serving low-income communities under particular pressure (New Zealand Productivity Commission, 2019). This finding suggests that the imposed 40 per cent contribution of repair costs to local government agencies (through insurance risk management arrangements) stipulated within the Civil Defence and Emergency Management Act 2002 may simply be unachievable to some councils and signals both a disconnect in the relationship between central and local government and a lack of appropriate funding.

6.2.4 Wider Central Government Guidance

As indicated earlier, in addition to these three key pieces of legislation are a number of important documents that represent wider central government guidance for local government on risk management. The 'Preparing for Coastal Change' guidance document, referred to earlier, is concerned with the effects of climate change for local government authorities located in coastal regions. The purpose of this document is to provide guidance to the many coastal based local authorities of New Zealand on the use of a cautionary approach to hazard, risk management, and future adaptive risk management considerations. The key messages within the guidelines that relate to planning and decisions include the following statement:

> Decision-making should consider the known levels of risk and the utilisation of existing knowledge surrounding uncertainty. It is advised that a precautionary approach should be exercised in future orientated decision making as it applies to new development (and the associated infrastructure) as well as any changes being considered to existing development (Ministry for the Environment, 2010, p. 28).

The future-oriented approach to risk reduction articulated within the document advises against new developments in exposed coastal areas (p.21). However, from the perspective of a precautionary approach to understanding the risks associated with a specific natural hazard, the document prescribes that the initial phase of

understanding risk be concerned with the consideration of the known risk environment through the utilisation of up-to-date information and lessons learned from past events.

The second document reviewed was the Ministry of the Environment's (2010) 'Preparing for Future Flooding' plan. It also recommends a forward-looking approach by local government (not specifically targeting, but including coastal authorities) regarding the potential future effects of climate change, in this case in relation to flood risk management. Following the principles of the AUS/NZ: ISO 31000 national risk management standards, this approach is grounded in consideration of likelihood versus consequences in the understanding and measurement of risk. The document stresses that the known risk environment is likely to change over time and that given the potential change in frequency, or likelihood of an event taking place, brought about by climate change effects, this will ultimately affect the consequences. However, in complete contrast to the 'Coastal Change' publication, the guidance on flood risk states that given the changing risk environment presented by climate change, historic or known flood risk flood events are less likely to enable the prediction of future events. It recommends establishing a revised statistical approach to the study of flood data to guide risk management decision making.

Having described and discussed aspects of the relevant legislation, guiding documentation and associated governance arrangements, the next section will evaluate their adequacy. Drawing on insights gained from the workshop and interviews, the evaluation will be grouped in accordance with Aven and Krohen's (2013) three-stage approach to integrated risk management (the broad approach to risk, the management of risk, and the future adaptation of risk management) by which to reveal how the findings around the governance system, the actors, powers and laws are enacted in reality against the three critical considerations provided by the Office of the Auditor General, described earlier in the chapter.

6.3 Assessing the Adequacy of the Governance Arrangements

6.3.1 The approach to risk management decision making under the current governance arrangements

As previously discussed, rising sea levels and more intensive rain events threaten local government waste/storm water infrastructure, but these risks are not evenly

distributed across New Zealand. There is clearly a case for the establishment of mechanisms to assist in sharing the cost of research that would otherwise be unmanageable for some affected councils. On releasing the draft (2019) report, New Zealand Productivity Commission Chair said "The current framework measures up well against the principles of a good funding and financing system for local government. It also provides a high degree of flexibility for councils to shape how they raise their revenue (The Productivity Commission, 2019).

The funding of research

The need for locally specific information about potential risks is critical for future-focussed local risk management decision making, but, as discussed in Chapter 2, local government funding is limited and there are competing priorities within operational expenditure. A comment made by a local government executive in response to the question of funding commissioned research by which to better understand their local hazard risk illustrated this point:

> "I certainly don't have a budget for it, so outside of what the insurance brokers do, we don't commission anything else. I'd be pretty confident this will be the same story for most small-to-medium councils."

This executive explained there was no provision for the funding of research on local hazards, either in-house or by 'commission', and that she believed this problem would be shared by other councils around the country. This concern was shared by an elected representative in response to the same question;

> "I am only too aware of what needs to be done in my community. I'm reminded by the proposals in the agenda of every council meeting and the calls and emails I receive from the residents. The fact is, there is only so much money and I am constantly looking at the bottom line. If you are asking me to decide upon approving the plans for a new playground or to decide if that money would be better spent on trying to assess our earthquake risk, I most likely would give my vote to the playground. I understand what you are saying, and I would dearly love to say yes to both, but the reality is we have so much money to direct to activities and I think the community like to see something for their money [rates contributions]."

These comments provide an interesting window into the issue of budgetary constraints, and the pressure councils are under to prioritise short-term operational spending that is visible to their communities, certainly from the discussions held with the local authorities outside of the main centres. The reference to insurance brokers reveals that councils rely to a large extent on risk modelling by insurers and/or their brokers in the annual insurance renewal cycle, and that the funding of tailored scientific hazard risk research is not seen as a financially viable option to the singular council.

This was also the case for local authorities that were part of a LASS arrangement where there was potential to achieve economies of scale through purchasing power. A risk professional of a LASS member council expressed that their council faced similar funding constraints, stating that:

> "Other than the 60/40 insurance arrangements, financing risk research doesn't rate highly in the priorities of our council shared service financing arrangements. Risk management within our LASS arrangement, in my view, stops at the purchase of insurance – any environmental research or reports are down to the individual councils to source. Certainly no one else in this LASS is having any research done, I know that much. We can't afford it."

In other comments, this risk manager explained that the focus of the LASS, in regards to funding for risk management, was solely to drive down costs to enable the member councils to meet the required 40 per cent insurance costs, rather than approaching risk management as a united group of councils. Within the context of these LASS arrangements, then, there were no real efforts to use the economies of scale of a larger entity to fund up-to-date knowledge of future hazards through additional research to guide risk management.

The sharing of knowledge and data

In the absence of funded research and little evidence of sharing between local authorities, the potential for the sharing of information between central government agencies and local government was explored. In August 2018, a working group of representatives from central and local government led by the Department of the Prime Minister and Cabinet was created to co-produce guidance on how central government can engage effectively with local government. With a catalyst of strengthening the

engagement between the two levels of government this guidance was published in 2019 and contains a section devoted to ‘partnership principles’ which are intended as a basis for building a meaningful and enduring relationship between local and central government founded on respect, reciprocity and trust (Department of the Prime Minister and Cabinet New Zealand, 2019). The translation of these principles into a practice of engagement is described within the (2019) guidance document as being achieved through a number of key aspects. The first of these is ‘communication’ and speaks to the provision of all the information needed for local government to engage effectively with central government. The rationale provided for this is that early discussions build better understanding and ensure that local government is better informed. This recognises that local government should be offered reasonable opportunity by central government to develop policy. This involves central government making an effort to better understand the environment that local government operates within.

The interviews, however, indicated that there was little sharing of knowledge and data on risk between central and local government. Such sharing was seen as important given, as the LGNZ President has stated, “central government in Wellington is not the best decision-maker for every local problem” (RNZ, 2018). She was making the case that local authorities should have the ability to gain a better understanding of the risks they face, and this includes up to date knowledge of their diverse and potentially unique hazardscape. However, from the interviews with local government risk professionals, there was little-to-no knowledge of the central government overlapping arrangements or that information and data was indeed obtainable. One local government risk professional commented:

> “I had no idea that this arrangement was in place. Are they supposed to offer this information to us, or do I have to ask for it? I was under the impression we had to pay for this research if we wanted it.”

A second risk professional from a main centre local government authority also commented:

> “If central government are doing this work, they certainly haven’t informed us that they are on our patch doing it. We have a couple of growth cells to

the North of the city and so far as I am aware the property developers are doing the ground work as part of the council approval process."

During the workshops a theme emerged in that, as council were unable to fund environmental hazard risk research and with no access to central government or neighbouring council's data to inform decision making, the responsibility was passed to a third party (e.g. property developers) to obtain the information if they wanted the council seal of approval to conduct works. Although knowledge is gained at no cost to the council, local government would not directly benefit from this arrangement given the small scale of the research undertaken, only intended to obtain a decision in relation to the development in question which may be confined to the construction to one property. As such, this approach to knowledge is a poor substitute for the gains that could be made from a networked sector approach to informed appreciation of local environmental hazard risk. There was a lack of understanding by the risk professionals interviewed about the access to councils to risk-related data and knowledge from central government. When the question was asked, 'Are you aware of these arrangements?' comments included "Are you sure??" (General Manager), "This is news to me" (local government risk manager), and "This has not been made clear to me in the very regular meetings that I have with central government departments" (senior planner). This may indicate, that knowledge of the arrangements is not widespread within local government and as a result, there was little evidence that local government risk management professionals had taken advantage of the access to local hazard information held by central government exists.

Summary of the approach to risk management decision making under the current governance arrangements

In summary, the approach to risk management decision making is confounded by a lack of funding within local government for up-to-date local hazardscape research, competing operational priorities for what money was available, and a lack of sharing of data vertically or horizontally across the networks. As a local government elected representative commented:

"The list of things to do, things to repair and things to create to accommodate the growth that is happening now far exceeds the budget we have. I hear what you are saying about the need to look ahead and how we

need the knowledge to do that, but I don't see any other way right now. I'm guessing there's some information from central government on line we could be using for this, but I can assure you, there's no more money coming in from them so we have to do what we can with what we have now. It does feel a bit like we are directing traffic at times in the things we have to approve, but please, please be assured – these are things that require immediate action and we are doing what we think are the right things to do."

Given this quote by an elected representative, and the previously discussed evidence that the source of information regarding the local hazardscape was reliant on the outcomes of a broker during the annual insurance renewal cycle, it becomes clear that a non-virtuous cycle of short-termism has been created, as illustrated in Figure 8 below. Because the knowledge to assist in the long-term consideration of the local hazardscape cannot be financially achieved, a short-term, operational cycle has become the practically viable option for decision makers. This presents a lesser level of risk involved in decisions given that budgets are largely accounted for, and further contributes to the problem of short-termism. The left-hand cycle of the figure represents how decisions, such as the approval of the annual insurance renewal, are routinely made and passed down to administrative officials and, in order to ensure consistency and efficiency in service delivery, these risks are subject to audit (or maintenance) and risk review. The left-hand cycle captures processes that emphasise efficiency – decisions can be quickly made and enacted within the hierarchal decision structure with the day-to-day delivery of services subject to annual budget, routine checks and risk considerations such as annual maintenance. However, given the limitations of options offered to decision makers, longer term strategies (represented by the right-hand cycle) are approved and operationalised. This means more complex strategic matters are tackled within current operational budgets, within the operational cycle, leading to the neglect of long-term risk management. This is evidenced by a comment made during an interview with an elected representative;

"The long-term plan and annual planning processes organises how we do and plan for things. When we are elected we inherit the long-term plans and, to be fair, management are usually pretty good at forecasting the costs based on growth etcetera and rejigging the numbers when it comes to the annual plan. The problem is when new stuff comes up. I am not an engineer

so I look to the engineers in our council to give me advice and guidance in terms of a new strategic activity. These could be two, three, ten years' worth of work and I personally feel I'm given just enough to get whatever it is over the line. It's almost become standard that my fellow councillors will ask what can we do now with what we have and this is always well received by management. It's like the more visible or attractive jobs will get the green light while the more controversial ones will be deferred. We've even gone to referendum over some stuff!"

Two observations can be made in relation to this statement. The first is supportive, that it is preferable to both elected representatives and management that longer-term strategic tasks are broken down into operational deliverables (depicted in Figure 8) as opposed to a phased approach which may span a number of years. Second, this comment gives rise to the consideration that elected representatives may in fact 'cherry pick' the strategies which are operationalised, based on the activity's visibility and public perception, perhaps creating re-election opportunities.

Figure 8: Operational and Strategic Risk Cycle as a Result of Governance Decision Making

The approach to risk management decision making is dependent on the quality and extent of knowledge provided to the decision makers (Massignham, 2010). However, as previously discussed, the interviews have highlighted a lack of central government proactivity in the sharing of information and knowledge, and an absence in awareness by councils that this information was available. This paucity leaves the councils to fund and decipher their own scientific research. Due to limited and already committed

funding within local government local hazard research is reliant on the findings of annual insurance renewals. These findings present a short-term, operational focus to the approach of risk management.

6.3.2 Assessing the adequacy of the governance arrangements and the management of risk on a day-to-day basis

The lack of knowledge around the timing of future risk in current decisions

In order to acknowledge present and future risks, one of the key challenges in local government decision making is the ability to interpret the risk-related timeframes for the planning for future risk scenarios and the way, for example, that they might have an impact on core infrastructure. The New Zealand Coastal Policy Statement provides guidance on timeframes for assessing coastal hazards of at least 100 years under policies 24, 25 and 27 (Department of Conservation, 2019). This lack of knowledge was recognised by a local government elected representative who commented:

> "I am not a scientist and have no idea what it practically means to the decisions we make or the consequences of them when people talk about something might happen in a thousand years' time."

A similar quote was provided by another elected representative in reference to the timing of natural hazard events:

> "We have so much to do in our terms as councillors and only so much time and money to do them. I don't know what a one-in-ten-thousand-year event is in reality, or what it means. Let's think about that for a moment – ten thousand years. Or, should we mend the holes in the roads, create places for children to play and focus on the things we should be worrying about, make our city a great place to live here and now?"

These quotes are representative of those made by many elected representatives who are appointed as community representatives and lack an environmental hazard risk management background. As such, elected representatives are reliant on advice and guidance in the options offered to them by administrative officials and, in the absence of this, a lack of understanding about the timeframes associated with risk has the

potential to lead to an *increase* in risk, especially if appropriate planning timeframes for decisions are not included in planning processes (GNS Science, 2017).

The lack of central government guidance on the timing of risk management to assist in decision making

The interviews revealed that choosing an appropriate timeframe was difficult for elected representatives who tended to focus on outcomes within political cycles, rather than the long-term (Deyle et al., 1998; Ericksen, 2005). A comment made by an elected representative reinforced this insight:

> "I have been elected for three years - What possible difference would a decision I made today make to an earthquake that is meant to happen in ten thousand years' time?!"

There were, therefore, few immediate imperatives to focus the attention of elected representatives on the long-term. However, there is no national regulatory standard approach for deciding what timeframes should be used for natural hazards (GNS Science, 2017). In the absence of the regular and ongoing monitoring of the effects of climate change by central government, there is also no consistent guidance on hazard timeframes for local government on which to base decisions.

The decision of what timeframe should be used involves a value judgement in the local government political arena. At one end of the scale are hazards that produce modest levels of damage on a relatively frequent basis and at the other are catastrophic events that recur less frequently, perhaps only once every 2,500 years or more (Ericksen, 2005). High consequence, low-likelihood events are the most difficult hazards to manage (Slovic et al., 2000) due to a lack of understanding and awareness of the consequences of these events. However, flooding, coastal erosion, landslide hazards and tsunami risk are likely to be increasingly influenced by the effects of climate change, ultimately magnifying their risk profile (Becker, 2015) This is important as it means that, for example, coastal erosion time frames of 100 years are adjusted accordingly to incorporate climate change. That is, what was a '100-year event' in 1990 is likely to be far more likely in 2020 (GNS Science, 2017). There is no consistent guidance on hazard timeframes for decision making in New Zealand (Saunders, 2010) as not all perils which share characteristics are created equal. This is part in part due

to forecasting and warning capabilities. For example, high rainfall events can be forecast, flood warnings can be given, and evacuation of communities at-risk is possible (GNS Science, 2017).

Summary

Two issues are identified in consideration of the adequacy of the governance arrangements and the management of risk on a day-to-day basis: there is a lack of knowledge and understanding of the timing of risk management decisions, and there is an absence of central government guidance by which to base long-term local government risk decisions today. This essentially leaves council decision makers with the action of 'choosing' the timeframe within which to act.

As discussed in Chapter 2, the current legislative framework establishes governance arrangements that devolve decision making responsibilities on a 'top down' basis from central to local government. The findings thus far reinforce the existence of risk management problems arising from a short-term local government focus tied to the three yearly electoral cycle.

Elected representatives now face the dual demands of contributing to present business operations and simultaneously positioning the council to meet the more strategic futureproofing risk management requirements of infrastructure (Peterson, 2003). However, the findings so far identify a lack of understanding and awareness of the consequences of long-term hazard risk management and a lack of up-to-date legislation, policy or supporting information by central government. It is, therefore, a difficult task for elected local government representatives to comprehend and envisage long-term hazard risk management. Instead, the common approach taken by the elected decision makers interviewed was that of an, 'It won't happen in my lifetime,' view (GNS Science, 2017). As such, day-to-day risk management decisions were short-term focussed and tended to be fixed within the elected cycle, or at least the immediate foreseeable future. This means that a risk within a 3-5-year timeframe was treated similarly to a 1:50 year expectancy. Such hazards included largely predictable flood and drought scenarios, often experienced on an annual basis (GNS Science, 2017)

6.4.3 Assessing the adequacy of governance arrangements of risk management adaptation

Limited policy guidance

Given that the legislation, supporting policies and guidance are largely static, the approach to understanding risk and the risk management decisions made today significantly impacts the orientation towards risk-related adaptation. It is increasingly a requirement that guidance and supporting information be given to those making risk management decisions within local government. In response to this, several guiding documents have been issued, as previously discussed in this chapter. However, the provision of guidance by central government is not a mandatory requirement (Department of the Prime Minister and Cabinet New Zealand, 2019). For this reason, there is no obligation to perform regular reviews and updating of guidance documents. The need for policy to support the co-ordination of activities across local government has been mooted as a way to accelerate awareness of the connections between natural hazards and climate change (Glavovic, 2014), but little evidence is available to show that this has been incorporated into the statutory framework.

An example of linkages between legislation in regards to natural hazard risk management can be found within the Resource Management Act 1991, and, to an extent, its relationship with the Civil Defence and Emergency Management Act 2002. This linkage within the Resource Management Act 1991 is found within the allocation of roles and responsibilities in response to an event across multiple levels of government. For instance;

- the activation procedures in a cross-boundary natural hazard event that takes place across multiple local jurisdictions,
- where the matter is of national importance and a state-wide response may be required,
- the inclusion of regional policy and plans which govern across a regional level, and
- district plans with rules that are implemented at the local level of government.

The above points describe reactive steps to be taken in response to an event, and the corresponding legislative linkages are found within the Civil Defence and Emergency

Management Act 2002, describing what are known as ‘Lifelines Groups’. Under the Act, these groups have the ability to facilitate co-ordination in an event as described in the above points of the Resource Management Act 1991. The intent of the CDEM framework is also on pre-event planning and “to reduce infrastructure outage risk and minimise restoration time when outages occur” (Civil Defence New Zealand, 2017). However, a comment made by an independent risk professional around the real-world application of this Act is that:

> *“*The CDEM Act just stifles any future-focussed intent. *It has a limited view. The reduction and readiness sections of the Act are very much overshadowed by the response to an event and given that councils are for the most part operating individually, a cross boundary event is going to be met with a lot of administrative confusion”*.

The comment of cross boundary and administrative confusion refers to the previously discussed tendency for councils to react on an individual basis to emergencies, with a limited approach to risk management - The independent risk professional continued;

> “The problem is that they [the councils] are pretty much all going about hazard management differently. Because they don’t have the money to commission in depth environmental research, most of them take what they can glean from the brokers in the insurance renewals. But some councils use one broker, another will use a different one. What I’m saying is that if there was to be a cross boundary event and the councils were to put all their data on the table, it’s highly unlikely you’ll find a comparable apple with apples approach.”

This finding coincides with those of the approach to risk management and the day-to-day management of risk in that limited financial resources, a lack of articulated requirements and guidance within legislation and policy, and little to no intervention by central government, lead to a short-term approach to risk by local government.

<u>An isolated approach to risk management decision making</u>

As discussed throughout the chapter, there is increasing evidence to support the claim that many councils outside of LASS arrangements are approaching and managing risks in isolation and within short term timeframes. A report by the Office of the Auditor

General (2014) on the future risks and management of water supply and service provision supports this finding and provides a relevant example that this finding is a recognised issue within the governance framework.

Along with the analysis of the current state of infrastructural assets and where and when further investment is likely to be required, the report also questioned the extent and effectiveness of cross boundary asset and risk management protocols (Office of the Auditor General, 2014). Furthermore, the report proposed that central government is not giving local government sufficient information and guidance on regional arrangements across boundary networks or the regional hazard knowledge required in order to continue providing effective services into the future. This was also referred to by a senior local government planner who said:

> "There isn't really much to go on in terms of information of what other councils are doing, or rules to say how they should be doing it. We aren't part of a LASS arrangement and we only have so much money for our own problems. We certainly spend more time on the more populated areas rather than the boundaries. I'm guessing they [the neighbouring councils] are too. I certainly don't talk to anyone in another council about this and I never hear anything from central government to say I should be doing this another way, so we just carry on looking after ourselves."

This quote illustrates that given the lack of any overarching central government guidance and limited financial means, local government decision making is aligned to the allocation of what resources they have back into the risk management of their own individual communities. The Office of the Auditor General (2014) report articulates that current hazard risk management practice within local government is likely only suitable for the short to medium term at best. The report also determined that local government will need to do more to appropriately manage infrastructure and the associated financial strategies for the long-term, particularly given the wider economic and population changes that New Zealand is set to face. However, a recurring finding of this research is a lack of money by which to invest in risk management. Can long term adaptive risk management be reasonably achieved within local government? This question was posed to a local government risk management professional who responded in the following way:

> "I don't think so. Certainly not in the time frames that are needed. The problem is there just isn't the money and it's difficult to get a councillor to agree to something we are doing to protect, say, infrastructure for the next three hundred years. I can see their point of view though, there's stuff that like holes in the road that needs doing here and now. OAG [The Office of the Auditor General] can criticise, but is central government actually onto this? Where are the rules where we can say to councils, well actually we do have to do 'this'?"

This quote suggests that local government administrative officials are aware of the future problems that they may face. However, as most councils lie outside of the limited LASS arrangements, these problems are being tackled in isolation with limited budget, and without the legislative backing by which to coerce elected decision makers into making long-term adaptive decisions.

Summary of the adequacy of governance arrangements of risk management adaptation

Two key issues have been identified in regard to the long-term adaptive risk management of local government owned infrastructure. Firstly, this practice requires financial investment, but limited funding within local government was a recurring issue. Councils were found to be already stretched to meet the priority operational demands of their communities before consideration could be given to the funding of future orientated risk. Secondly, again, the lack of funding for up-to-date environmental risk hazard knowledge results in limited options being provided to elected decision makers. As there is a lack of central government guidance and legislation that may assist in the decision-making process, there is little motivation for the term of decisions to be made beyond the election cycle. Mandatory guidance and changes in legislation towards long term adaptive risk management may assist, but at present an isolated short term, operational culture exists in application and central government intervention is likely required.

6.5 Conclusions

Given the current general lack of legislative directive for how to incorporate climate risk and its uncertainties into local decision-making. The precautionary approach to

risk, the management of risk, and future-focused adaptation within council practice was found to be characterised by a short-term focus largely as a consequence of a lack of legislation and guidance. This process, which necessitates learning, investment of resources, and policy development, must occur while local government fulfils the range of existing responsibilities. As such, climate adaptation is currently competing for space on the policy agenda as thus the budget of local government (Measham et al, 2011). An additional problem was that local government was struggling to reconcile long term risk management with competing financial priorities without intervention by central government. As such, the approach to risk management can be said to be flawed, and it cannot reasonably be expected that local government can adequately manage longer term, more complex adaptive considerations. This means that collectively, local and central government will remain in a largely reactive state with insurance being the only obvious solution, resulting in an individualised approach by councils, and a lack of vertical and/or horizontal sharing of knowledge and risk management arrangements.

Central government guidance undeniably promotes a precautionary, risk-based approach to planning for natural hazards, albeit mostly focussed on coastal and flood management. In addition, this literature addresses the matter of risk evolving over time in its rather technical recommendations. Conversely, the guidance on Resource Management Act 1991 section 32 assessments is largely risk-based but, while it recognises the need for flexibility, the Act is silent on the matter of change over time. Regardless of these merits, the guidance documents lead decision makers towards a ‘two-dimensional’ framing of risk.

Without knowledge of the timeframes associated with risk in a risk management approach and the lack of central government guidance by which to understand and implement risk management practice today, risk assessments are uninformed, unsophisticated and tend to be made in a way that is static rather than adaptive. Risk management is enacted within the context of the specific decision-making practices of the elected representatives in power at that time. However, it is found that in part, through a combination of limited scientific evidence and options presented to elected representatives, along with a limited financial resource, there is a propensity for

elected representatives not to make decisions outside of the limits of their elected cycle.

The acknowledgement of risk over extended timeframes requires flexible instruments of practice, mechanisms for the ongoing monitoring and continued provision of comparable information, as well as achieving levels of consistency in the application of practice across the government framework (Aven & Krohn, 2013). The current framework is structured around a disjointed set of legislative statutes which each contain divergent methods of acknowledging long term uncertainty, underpinned with a lack of guidance and contradiction within those reviewed in this research. As such, the there are limitations to the long-term adaptive risk approaches by local government.

There is evidence of positive change across central government including situating the development of national climate change strategies directly within the Department of the Prime Minister and Cabinet. Like the LASS arrangements, the existence of cross-government committees in relation to climate change risk management and adaptation have been in existence for relatively short periods of time. However, there is found to be widespread and ongoing disparity in local government coordination of risk management and a lack of central government engagement. For instance, knowledge sharing arrangements established by central government was met by those interviewed in councils with ambiguity, and felt that integrated risk management could be better achieved through calls for increased central government funding.

In summary, the assessment of the adequacy the governance framework is that through a lack of guidance and oversight by central government, there is, through low financial resources and options presented to decision makers, a lack of motivation to consider risk outside of the election cycle. This short -term approach in application to a legislative approach, however, is not fully decisive in the absence of further assessment as to how risk management is implemented in practice. The next chapter will provide such an assessment, utilising the same three stage approach to integrated risk to ensure consistent review.

Chapter 7 - The practice of natural hazard-related risk management decision-making

7.1 Introduction

The aim of this chapter is to add to the analysis in the previous chapter regarding the governance arrangements and related decision-making practices. This chapter takes a descriptive and analytical account of how these issues are enacted in practice in order to respond to the second objective of this study which is to **understand current decision-making practices, how they are coordinated, and the implications for risk management**. The term 'practice' as it applies to this research is made in reference to questions about how risk management is exercised within the governance arrangements: how is it executed through the hierarchy of legislation, through governance roles and responsibilities across the framework, and by the actors and decision makers involved? New Zealand's governmental practices take place within an environment with a relatively high level of natural hazards and susceptibility to damage from climate-related natural hazard events.

As discussed in Chapter 2, in New Zealand flooding is the most frequently experienced natural hazard with an average incidence rate of one major flooding event every eight months (Ministry for the Environment, 2010). To provide an example of typical costs, the nation-wide floods of 2004 were estimated to have generated expenditure of $380 million in addition to two recorded instances of loss of life (Department of the Prime Minister and Cabinet New Zealand, 2007, p. 62). One of the key problems now faced by government decision makers is the issue of climate change and the effects that this may have in respect of the current risk management arrangements around the ongoing protection of underground infrastructure. For example, sixty-five percent of the population and the related underground infrastructure is situated within five kilometres of the coast, and more than a hundred towns and cities built on flood plains. (Statistics New Zealand, 2019).

Chapter 5 provided insights into the adequacy of the legislative framework, however there is also the requirement to appraise current practice in terms of long-term risk decision making. What follows is an account of how existing decision-making practices enact the framework, and an analysis on the extent to which this practice is sufficient to address uncertain and complex problems. The descriptions of practice that follow

are based on the data from interviews and workshops held with practitioners and decision makers across a range of central, regional and local New Zealand government actors as well as relevant documents. As indicated in Chapter 4, the data were coded according to the consistency of themes. The resulting analysis of the responses are presented via the use of quotations and figures as a means of demonstrating these themes.

The current chapter applies the same categories of analysis in regard to *actual practice* of risk management as it occurs within the institutional context. The results are presented using the three distinctions which are representative of the dilemmas that occur within decision-making which were identified in Chapter 3 and Chapter 4. These are:

Governance arrangements and practices - considers what form or mode governance takes and how this affects practice. Procedures relate to how the roles and responsibilities are utilised and applied through processes. It examines how organisational and actor attributes affect decision making. This category provides a structure for discussion of practice and adequacy using Aven and Krohn's (2013) model of the three building blocks for an integrated risk perspective which was outlined in Chapter 4.

How these consider complexity and time – in connection with how risk characteristics are utilised and/or understood by the decision-making actors, and how the information used to inform decisions reflect the timing and complexity of uncertainty.

The process of understanding and representing risk are interconnected. Evidence of these undertakings can be found in the way that data is made accessible and managed, how risks are identified, and how they are managed and monitored. The cumulative effects of these activities can be found in the resultant decision making. Sector practitioners mainly held negative views as to whether these shortcomings were in connection with the framework or whether it was practices that limited consideration of long-term uncertainty, and this will be discussed in the next section.

7.2 Risk Management Arrangements and Practices

7.2.1 Data and risk approach

Successful risk management - and most certainly in terms of the decision making and anticipation of natural hazard risk - is largely dependent on accurate, current and accessible information (Shedden, 2010). In relation to the procurement and/or access of local environmental hazard research information within local government, in general, data was found by risk practitioner interviewees to be dated. As described by a South Island risk professional,

> "Risk management at my council carries no real budget allocation at all. If I want to know anything about the local environment, I can ask other departments like the City Waters team for anything they have, but this will be engineering based and doesn't really help me. There are old reports, but these are maybe ten years' old from the local civil defence team. If I want anything really tailored to risk management I would have to commission some scientific research and I just don't have the funds to do this".

When asked if it was a viable to share such research costs with neighbouring councils, the response was,

> "I've asked this before and there just isn't the appetite for it. Ultimately, we are responsible for the risks within our own borders so knowledge of other councils' problems isn't of interest to the councillors".

It was clear, therefore, that local authorities were operating in isolation in regards to the access of up-to-date risk data. Centralised repositories of resources, information and data were not maintained on a national, regional or local level and there were questions over the accuracy of in-house data. This was further illustrated in a point made by a North Island risk professional that, "I'm not hugely certain of the accuracy of values we declare to insurers of the age and condition of underground infrastructure".

If gaps in knowledge do exist as described, this leads to the probability that there are likely to be variances in the values declared to insurers in such a way that there is underinsurance on each annual policy renewal.

A key theme emerging from the findings was that long-term risk approaches were not framed (within data or advice) in a manner by which they could be easily understood and/or carry enough relevance to cater for the differing interests of administrative officials and governance. A common approach to understanding risk was in the form of statements of probability. Probability in risk assessment aligned to the ISO: 31000 standards is concerned with estimating the future probability of an event using a percentage number on a five-point scale which ranges from zero (very unlikely to occur) to 100 (highly likely to occur). This assessment is based around an articulated risk statement which provides the clarity and descriptive information required for a reasoned and defensible assessment of the probably of occurrence and the likely areas of impact. However, given the complex nature of the subject of climate change and inconsistent information that was considered by some elected representatives to be historic and therefore unreliable, statements of probability were reported to be an ineffective way of conveying information,

> "The only up-to-date information we receive, if you can call it that, is once a year when we come to the insurance renewals, but this is very summarised and sanitised in the reports to the point of only being one paragraph of information. As a council, I don't think we have the in-house expertise and if we push back for data or detail, [engineering] surveys and what-have-you that are a decade old will be what we are told about as the last work done" (local government elected representative).

Sector risk practitioners agreed that this this approach is most likely unsuccessful because it is incredibly difficult to assign probability with any degree of certainty pertaining to risks that are so complex.

> "What we are talking about it one-in-five-hundred-year stuff here, yet they [elected representatives] expect a definitive answer like we are supposed to know where, when and how something is going to happen. It's unreasonable, do you know what I mean? Research is expensive and there's no budget for it, but even then, it's not as if it contains all the answers. Risk is educated guesswork, but even then, we are giving advice on complicated matters to someone who used to be a policeman or sold cars or something to make a decision" (local government senior risk practitioner).

This quote portrays the low confidence of the governance audience, who are likely to have no formal background in climate change and therefore an undeveloped understanding of what probability statements are trying to convey. There were, however, some instances of decision-making practice in which local agencies were attempting different methods of discussing a risk-based approach to climate change adaptation that had led, with some success, to long term uncertainty being incorporated into assessment processes. These examples leveraged off the simple concept that risk is dynamic and therefore can increase, reduce and change course. This basic methodology was readily accepted by elected representatives and as such, they were able to orientate the use of recent events and experiences towards risk management decision making and lay the foundations to begin the management of uncertainty. This use of relating events that have likely been experienced first-hand by elected representatives brought the subject of risk closer to people's own understandings with the outcome of increased engagement and comprehension. For instance, one elected representative stated, "I was in Christchurch during the earthquakes and the damage, panic and chaos is still fresh in my mind whenever we start to talk about insurance and risk".

The practice of framing a consistent approach to assist in the understanding of risk was certainly found to be emerging in a few of the councils, however for the most part an individualistic and uneven approach is being taken by councils in interpretation and application of the same rules and standards. Patterns of increased concern and awareness seem to follow a recent natural hazard event, but this is not sustained. Without being embedded in the institutional framework, these concerns drop from the agenda soon after.

7.2.2 Fragmentation

Across the wider framework, fragmentation of information sources were noted in regard to the information provided by central government agencies which led to confusion and frustration at local levels.

Almost every practitioner stated that their respective council was engaged in environmental risk management of some sort, and there was commonality in the subjects of interest. As previously discussed, in New Zealand flooding is the most

common damage causing event. Predictably then, there is considerable interest in flood management modelling and inundation mapping as a means of informing the risk management of infrastructure. The absence of a national approach to this research along with the lack of a centralised repository of information has led to inconsistency in terms of approach, methodology and application in each instance where a council has commissioned a study of this nature. This was described by a local government senior planner as “inefficient in terms of cost and responsibilities”. The costs associated with commissioning the procurement of knowledge were described as high and the application of the findings as limited by a local government executive (referring to recent university commissioned seismic research);

> “What we can do reasonably do with the findings isn’t always practical and the remedial work could cost millions of dollars, if anything can be done at all. However, we’ve spent ten thousand dollars on it and questions will be asked if they find out”.

This quote describes a scenario of administrative officials obtaining knowledge as detailed as an expectation of risk management within the Disaster Management Plan, but at the same time burying the information (and its cost) to deter elected representatives probing and leaving the institution open to public scrutiny (and potentially litigation) due to perceptions about the poor use of rate payer money in unused, expensive information and decision making.

The result of this disjointed approach to research accompanied by the disparities in central government’s information resources and the overall collection of data was reflective in the participant’s relatively low levels of understanding of long-term risk management and how it can contribute to decision making. There was little evidence discovered throughout this research that a data driven approach was being utilised to inform decision making processes within local government. Historic data was not used consistently in an attempt to predict future events and options presented to elected representatives were minimal. However, there are some signals of change with a small number of larger councils planning to seek external advice from experts such as academics, scientists and environmental engineering consultants.

7.2.3 Leadership

Uncertainty, as it applies to long term environmental risk, was largely considered by local government respondents to be indistinguishable from any other long-term strategic risk topics, such as growth and economic development. As a result, there was little awareness expressed by the respondents across local and central government in relation to the act of decision making. An example typifying the apparent grey area between environmental and long-term strategic business risk was the comment, “what do you mean, civil defence stuff?” (Local government senior planner). Furthermore, there was little knowledge in regards to the timing and trajectory of risk. Given that the risk management of infrastructure is transferred via instance arrangements, cover (and cost) is risk based. If the time frame of a natural hazard event is short, such as one-in-five- or ten-year event, this is of higher risk and by consequence higher cost to cover. Of course, in some cases such as flood scenario planning, a council may decide to reduce the risk through, for instance, the investment in stop banks. However, for investment of this scale, decision makers would require accuracy in the timing of the risk. As noted in Chapter 5, there are no generic guidelines to the required timings of natural hazard threats, given the need to constantly calibrate timing and knowledge against climate change progression. Also noted is the tendency of politicians to act within the timing confines of their political cycle. An example of this was found in a response from an elected representative who, in relation to the timing of natural hazard events stated, “You see, we don’t need to really think about that. All of the one in five-hundred-year stuff is taken care of by the insurance advisors. We [the elected representatives] just need to approve it”. Rather, in most cases, consideration of long-term risk fell into one of two categories. Either hazard risk management was deferred or left out of any discourse due to an absence of specific knowledge and/or reliable data, or respondents held the belief that central and local government respectively assumed that the other part would conduct local research that would provide answers to, or even resolve, the problem of uncertainty.

The elected representative in question was seemingly happy enough to receive information from administrative officials based on third party expert advice, i.e. from an insurance broker. However, the flow of information for those interested or requiring more knowledge of risk management arrangements than those provided in a high-level report to governance was found to be limited. This could speak to the governance

structure of bottom up reporting by specific individuals to specific governance committees. This indicates that the vertical flow of information via reports from management to councillors is effective enough to obtain decisions within a council, but is failing to provide knowledge horizontally at a departmental level. However, a local government respondent described the dilemma of poor information systems as a problem across the whole sector, affecting the networked obtaining and transparency of information:

> If you want to know anything you pretty much have to find out yourself and that sometimes depends on who you know. The insurance companies only really know what we tell them, and the same can be said for every other council, so how do we know how we compare? Also, we have other councils on all sides so as soon as they hear you are getting some work done [commissioned research], they'll want to get in on it. They don't offer any money, as they can just apply for it under LGOIMA[9] anyway. This is a real challenge for us. (Local government general manager)

Comments of this nature were made by government actors throughout this research and indicate that risk management is localised and regionalised. This is understandable given that local hazardscapes and risk exposure differ across New Zealand. However, there is disparity between local councils in their isolated approaches to ascertaining reliable data, with a degree of reliance on unfunded and ad hoc data sharing rather than a coordinated, regional/cross institutional framework effort. This can make decision making difficult, especially in cases where local government elected representatives want to apply a precautionary approach (as discussed in Chapter 5) through a wish to better understand the uncertainty and plan over longer timeframes.

7.2.4 Emergency Management

A defining feature of planning is that it is informed by sound evidence (White, 2019). Councils have to focus on the municipality's needs and, as previously discussed, every election brings change - whilst one council may favour improvements in road

[9] LGOIMA (Local Government Official Information and Meetings Act 1987). Anyone can request access to official information from local authorities, so that they can have a say and an opportunity to influence the actions and decisions of local authorities, or hold local authority members and their officials to account for any decisions or actions they take.

improvements, the next may turn things around completely and shift the focus to building new parks. However, as infrastructure is mandated to local government by legislation it is important that knowledge of the local hazardscape is maintained in order to influence and assist in decisions. Limitations on the sources of finances make it challenging for municipalities to manage risk in this. The most common sources of revenue are generated through rates, development contributions and licensing fees (Local Government New Zealand, 2011). However, if councils choose to work autonomously, the budget allocate to procure knowledge may be minimal, particularly for those with a rural environment and low rate base.

This suggests that some local governments may not be well prepared. A report by AON insurance in Australia supports this view and states that about half of municipalities aren't giving enough attention to environmental issues (Eisenstein, 2018). Aon are well placed to comment, given that they provide 80-to-90 per cent of commercial insurance cover to local government agencies in the 60/40 arrangements (personal correspondence, 2020). According to Aon's (2018) Local Government Risk Report, a fifth of local government councils don't have a process for hazardscape risk profiling. As a result, this means that they are more inclined to rely on insurance claims to address risks after they happen.

Of the key risks in Aon's (2018) report, infrastructure was ranked first. Councils that were found in the (2018) report to be better prepared was through the use of data-backed risk profiling and gap analyses. Informed data was described to help municipalities' measure and manage their risk appetites. By conserving on other parts of the municipal government's budget, it frees up financial resources to invest in risk management and other projects for the benefit of the community (Aon, 2018).

7.2.5 Elected Representatives

An emerging pattern from the data was that even when up-to-date information regarding local hazards was made available, there was reluctance on the part of elected representatives to use the information in application to decision making. This was due to a number of reasons, including:

- The fear of long-term commitment. "The environmental reports we get from the university or engineers can pick up fault lines or new flood plains which need to be managed going forward. Councillors will generally try

and play down the risk saying a fault line has been there for a million years, and then opt for a fix like warning them [the community] and adding it to LIM reports rather than laying down any long-term plans" (local government risk manager); and

- Making the wrong decision close to an election. "There is no chance they'll make a big or controversial decision on the run up to elections. They don't want to get it wrong and lose votes. Fluoridisation [of the local tap water] was a good example" (local government executive manager);

Some levels of doubt in connection to the latter were articulated during the workshops by a minority of decision makers who attributed perceptions of impracticality to a general lack of understanding on the part of elected representatives. This was in connection to a combination of impracticality or resistance to their responsibilities to consider the effects and consequences of climate change, and fear of challenge - legal or otherwise - if the community was negatively impacted in a natural hazard event.

Risk practitioners at Dunedin and Auckland Councils shared the view that diversity in the outlook and opinions of elected representatives were compounded by the pressure of ongoing electoral achievement, and this made it difficult for them to fully support and commit to long term decisions - particularly in relation to dilemmas which contained uncertainty. Further, Wellington and Hamilton City Council contributors described a practice that focused on decisions based on a limited range of options within management reports. These options were described by a senior planner within Wellington local government as typically "easy or common-sense options" that would be inexpensive to enact and would "likely be approved by governance without too much fuss from councillors or any real additional work on management's part". They reported that wider considerations and arguments for or against a full range of risk management options were neither presented by administrative officials, nor discussed by governance. Wise et al. (2014) discuss the common tendency to reduce the number of possibilities or choices as early as practicable in instances where the subject matter is not well understood. This appears to be the case within local government, with consistent reporting by respondents that that the mode and outcomes of these decisions trend towards the most conservative 'acceptable' option. This is found to be largely due to one of two reasons. Either that decision makers take the path of least

resistance in decisions being mindful of community pressure - or indeed, public dispute – as key catalysts if they wish to remain elected. Alternatively, administrative officials are found to present only what they consider to be enough information and/or options by which to direct the decisions made and their timing, essentially shifting the power from the governance layer down to management.

Governance, in this context, refers to arrangements for governing risk management. These arrangements describe roles and responsibilities through legislation and, therefore, determine regulatory practice and how these roles and responsibilities are enacted throughout decision making processes.

Knowledge plays an important role in individual decision, and the sharing of knowledge leads to improved collaborative decision making and the building of "collaborative knowledge" (Arduin et al., 2013). While it is found that there is some collaborative effort between central and local government occurring, virtually all local government research participants were cynical of the central and local government working together collaboratively in practice. Efforts were described by one senior risk practitioner as "…knee jerk reactions made for show, but the usual arm's length central government ethos continued". This example was used to describe a nation-wide effort to coordinate individually held risk management frameworks and risk registers. The local government senior risk practitioner continued,

> "We [councils] were all asked to share everything. Risk registers can be very sensitive and of course some didn't want to just send them in -we weren't told what they were going to do with them. Nothing happened in the end. I don't know if they didn't get enough of them through or they just didn't know what to do with what they got. Who knows"?

Another example from the findings was of central government inserting themselves into the local government process. An example given was during the locally managed recovery phase of a moderate weather-related event which did not meet the 60/40 criteria. Described by a local government executive as,

> "Very frustrating... I think we were doing a good job of balancing what needed to be done and keeping the community informed, but a central

> government department [unnamed] called me and basically took over. [when asking about collaboration and knowledge sharing], No, not at all… this did nothing but complicate the situation and created additional work for us [the local agency] in writing reports for them [central government]".

These examples support the finding within the Department of the Prime Minister and Cabinet New Zealand (2019) publication that many local authorities, ‘‘see themselves as autonomous bodies and feel that central government agencies sometimes treat local authorities as local offices or branches". Central government actors, however, when interviewed were found to stand by the partnership principles. A senior advisor from Treasury viewed their role as "important in terms of exercising influence to assist local government in the management of risk", and remained steadfast in only providing enough guidance to councils to support decision making processes rather than 'directing' local government, which have historically been supported by regional councils (Logan, 2013). The RMA is designed to promote consistency of approach between regions and districts (Randerson et al., 1990), and accordingly a workshop discovered that some regional council practitioners do not want to direct local government. Conversely, the local authority response was the need for more specific guidance from regional rules on natural hazard risk in order to support local decision making.

This lack of integration and/or coordination of efforts is undoubtedly frustrating for all concerned. The result of this was described by one local government planner as "…wasted time, effort and rate payer money". This can be directly traced back to, firstly, local government working in isolation on a sector-wide basis, and secondly, the desire of local government for a greater effort on the part of regional councils to work in a more inclusive manner.

7.3 Assessing the practice

In practice, the long-term risk decision making undertaken by local government is found to be poorly developed and lacking an integrated risk management approach. The themes that have emerged from this research to support this statement include:

- A low-level approach to understanding the local hazardscape through a sporadic, isolated and unbudgeted approach to research;
- Fragmented decision making across councils, some of which was based on inconsistent information provided by central government; and,
- A tendency by elected representatives to further reduced that already limited options presented to them through fear of contention or negative public perceptions in order to remaining elected.

An observation made by an independent risk consultant on the subject of short-term decision making and limited available budget was that,

> "In my experience, local government only has so much money to put into something, so if, for example, an activity or asset is required to manage a risk, then funding is made. But there is an expectation that that's it and whatever decision is made today will have to last for years to come".

The quote refers to problematic 'path dependence' dynamics, whereby investment in decisions made today become locked in, and are unable to be changed in line with new information about future risks (Mahoney, 2000). Effective risk management is not just a matter of more and/or better data, or improved policy, rather that there is a tendency by natural hazard decision makers to lean towards solutions to current problems (Haughton & White, 2017). It is acknowledged that there is a distinct lack of guidance regarding the timing of environmental risk decision making, particularly over longer timeframes. The lack of resources contributes to the inability of governance to consider the long-term unless they are explicitly directed, and the finding that administrative officials provide only the information and options deemed necessary to obtain a decision does not improve this dilemma.

Remembering that the LASS arrangements are only in place in the North Island, there have been some attempts at coordination to create regional hazard plans for the purpose of risk management decision making. The outcomes of these efforts were described by a local government risk manager as for the most part, adequate at best, but what was perceived to be a good example was described in the interview:

> "Four councils; Porirua, Wellington, Hutt and Upper Hutt, along with the Greater Wellington Regional Council - They are working together to develop a really nice integrated approach to hazard management. This is a good example of a collaborative strategy and this will hopefully avoid the individual approach to understanding our risks which has pretty much become common place".

This quote highlights that the shared development process is leading to a positive collaborative outcome in the Wellington Region but, conversely, a comment made by an independent risk consultant regarding the lack of collaborative arrangements indicates an attitude that collaboration between councils is neither wanted and, furthermore, widespread adoption of the LASS model would fail;

> The lack of a LASS here [in the South Island] doesn't surprise me. It's very parochial and councils cling to regional identity in the South. It's a whole different country to the North! There is conservatism, old established families with a lot of resources and clout, ruralism, lower levels of education…and a very clear sense that we are NOT the North. There are no aspirations to be like the North, and therefore we shouldn't be led by its example. Talk about the Great Leap Backwards!

The step towards a regional framework through networks and the connection of district and regional plans will also assist governance in the integration of roles and responsibilities. There is evidence that local authorities, when arranged so that they combine the functions of both regional and district level governance[10], have executed measures to address longer term hazard risk more readily than those where regional and district administrations are separate entities. For example, Tasman District Council (a local authority maintaining regional and district functions and powers) successfully applied coastal hazard land-use controls with low contestation or recourse to the courts, largely due to land-use planning and coastal hazard management integrated under the one governance arrangement (Lawrence, 2016).

[10] As discussed in Chapter 3 regarding the Nelson/Tasman amalgamation

7.3.1 Integration

The current governance arrangements were found to not facilitate the rules and practices that would enable risk management to mitigate likely climate change scenarios. This was a view held by many of the participants in this research and also supports Lawrence's (2016) findings around long term adaption deficits within government decision making. The result of the problem of translating uncertainty and natural hazard characteristics into regulatory practice has led to the implementation of static methods of risk management. For example, snapshot flood lines in plans based on a limited valuation of event probability and at-hand knowledge of previous patterns (City council senior planner).

Although the IPCC has issued some probability statements in relation to sea-level rise (Church et al., 2013), no statements have been issued by New Zealand's central government about how the IPCC's probability modelling applies to future flood scenarios. Instead, guidance provided endorses the use of scenario planning and data to map change in risk and advises that resultant decisions should be made within a set risk tolerance. However, from discussion with the interview participants, the practice in reality is not reflective of this instruction with the reason for this to be largely cost related.

The Local Government Act 2002 requires agencies to act in the most cost-effective manner. Consequently, the cost-benefit analysis aspects of decision-making feature heavily in long term risk management. This is problematic for councils in the weighing up of the potential long-term consequences of present-day decisions made around complex scenarios of infrastructure. Respondents from numerous councils reported the need for administrative officials to offer increased options in the recommendations made to governance in regards to actionable strategies that offered short term implementation with perceived long-term effects to benefit the wider community. Respondents regarded that this practice was in fact pressure exerted on administrative officials to provide the fodder for fast governance decisions. These decisions were described as made for a show of elected representative's efficiency, but in actuality were quick wins where future recalibration would likely be costly, if actionable at all. This issue was addressed by De Bruin and Ansink (2011) who point out that a blend of the discount rate, uncertainty, and the cost tangible and intangible actions governs

the ideal measures. An increased level of hazard event damage and later resolution of risk raises the stakes of an investment decision. Furthermore, the ideal investment decision taken now is subject to the possibility that decisions can be adjusted in the future.

The observation of decision-making practices has revealed a number of themes. Firstly, the various levels of government within the framework are found to have produced isolation and ambiguity for those executing the framework through regulatory practice. The absence of coordinating networks across the governance framework are evidenced by the identification of local authorities working in isolation in data gathering for risk management, producing inconsistency at a national level. This lack of integration is further emphasised through ad hoc, isolated decision making. Secondly, there is a lack of central government instruments and data in place to support local level decision making, making it difficult for councils to plan for the long term with flexible assessment approaches and adaptive controls. There is commonality found in the desire for consistency across all levels of the institutional framework, and as a result there is some evidence of genuine efforts to better integrate long term risk decision making. However, the development of these networks is still in its infancy.

7.3.2 Risk Management and Decision Making in Practice

Long term consideration of the effects of climate change on government owned infrastructure is just one of many in a range of dilemmas that a council faces. In practice, actors within the framework are found to assume the risk management responsibilities allotted to them under statute, which have subsequently become institutional functions. These functions are then subject localisation through the influence of culture, norms and processes (Sausman et al., 2016) which contribute to the make up the structure and character of the organisation. The final element to this at a local level is the decision-making process undertaken by community elected representatives who are influenced in their role as decision makers through advice from internal management and external expertise. However, the consideration of long-term risk in this regard has a significant impact on most critical local government responsibilities. Whether this is the responsibility for prudent expenditure on the investment of millions of dollars in growth and the supporting infrastructure or the

outlay for the long-term protection of this critical asset, decision making occurs on a constant basis across the functions supported by the statutes which were previously discussed as being inadequately connected. For instance, there is an absence of statutory links between the asset plans within the Local Government Act 2002 and consideration of spatial planning under the Resource Management Act 1991, nor are there links between flood management within the Civil Defence and Emergency Management Act 2002m and the Resource Management Act 1991. As such, this affects the coordination - and indeed the amalgamation - between functions and, therefore, will influence the decisions taken. The key elements that inform decision making within a local government environment in relation to hazard driven risk management are: planning, which functions under a semi-legal framework and attempts to achieve certainty as an outcome and, most importantly to this research, emergency management, which focusses largely on the response and recovery from a natural hazard event.

A lack of coordination and consistency in risk decision making has, in part, been found resulting in fragmentation within the governance framework. The following section examines the consequences of this for the practice employed by actors within the framework and how fragmentation is apparent within the way that decision making functions are arranged and organised.

Local government water delivery arrangements are most exclusively functionally organised (Steytler & Fessha, 2007). Broadly, this translates to the number of public good and public policy focused drivers which are factored into the delivery of (SOLGM, 2017). The organisational structure that operates is one where employees are grouped hierarchically and managed through clear lines of authority. In this instance, the arrangement increases the existing fragmentation of the wider institutional framework. For example, in a majority of cases, the consent process at a local government level is done in isolation from the actual plan development. Furthermore, within regional councils planning is a detached process from hazard management and engineering. These scenarios could include, for example, planning and engineering in flood risk and hazard management affecting land uses, or interaction amongst all four functions (Lawrence, 2016).

Another factor affecting the level to which integration exists is in the abilities of the local government actors concerned, and the extent of the level of support provided by senior executive to elected representatives in their decision-making role. Again, cost plays a significant role in this dilemma of fragmentation of organisational form and function. This behaviour was described by a senior local government planner as 'buying knowledge' through the use of external consultants, versus the cost of sourcing and employing technical experts to build in-house expertise. Of course, there are many factors to consider at this juncture. One problem mentioned by a local government executive manager was limited expertise in the local market;

> "It's no secret that the talent pool in areas like Hamilton is really quite limited in comparison to other cities like Auckland or Wellington. The best way, I think, to attract talent away from Wellington is through higher wage incentives, but we really are constrained in that respect. It can be difficult to justify the cost of recruitment and more importantly the longer-term retention of subject matter experts, particularly when there are competing priorities with the churn of key operational staff. The only alternative that I see is to contract in consultants."

In instances where practice was found not to directly consider the longer-term effects of extreme weather events and natural hazards in general, the silo of functions were most prevalent. This observation is grounded in the extent to which a local government senior risk manager considered their sphere of practice and/or influence in regards to meeting statutory responsibilities, for instance: in-house risk assessment versus the need for up-to-date legislative compliance and associated financial considerations.

Poor leadership was found to be a consistent theme, and focussed on two key areas; poor leadership through limited abilities to steer functions, and secondly, poor leadership as problematic for decision making at a governance level. For instance, leadership that is able to think and operate strategically is more likely to enable better risk consideration at the governance level than leaders who operate in a short-term operational space. However, some respondents expressed scepticism about the abilities of some senior/executive level managers due to a lack of time or experience to comprehend the level of thinking required to address long term risks which carried uncertainty - such as climate change. In addition, at the elected official decision-

making level, a senior planner responded with criticisms of the membership of governance sub-committees. Matters presented to a full council are usually limited to those which require major decision making, including the passing of bylaws. In order to deal with other matters, subcommittees which elected representatives are appointed to, are formed and empowered to make the necessary decisions. The comment raised by the senior planner was that in many cases, the selection of the elected representatives was inappropriate to the subject; “What level of insight into environmental or political issues around risk expertise can we expect from a councillor who, this time last year, bought and sold cars for a living?” (Senior Planner, local government). Conversely, it was also noted that some elected representatives are particularly astute and asked questions that were in-depth and strategic in nature. This behaviour is usually exhibited by longer serving elected representatives, with the result that they were held in regard by their fellow elected representatives and local community.

In order to further explore the influence of the disciplinary practice of the actors across the framework, attention will now be directed to specific practices that relate to long term climate risk and how these influence decision makers.

7.3.3 Emergency Management Practice

The major focus of civil defence and emergency management actors within local government on a national level is response and recovery, and as a result of this the mitigation of risk through reduction and readiness activities receives far less attention (Glavovic, 2014). The consideration of emergency management is an important aspect of the risk management of infrastructure. A forward-looking lens of risk and adaptation is key to this research in the consideration of the increase and intensity of natural hazard events. But what about when an event does happen? Part of risk management is to attempt to control the outcome of a situation, but also the mitigating strategies to resume a process as quickly as possible after an event (AUS/NZ ISO:31000 Standards). This deficit is both systemic and historic, and stems from the Civil Defence and Emergency Management Act 2002, as discussed in the previous chapter. Notwithstanding calls for increased integration of planning through the RMA (Glavovic, 2014), planning and emergency management practices have to date been slow to meet (Lee, 2010). This is largely due to the dominance of disaster management

discourse (Glavovic, 2014). This situation was validated by many of the research participants when they were asked what needed to happen within government for improved or increased consideration of risk. The resounding response was “a disaster event”, made in response to describe an event which resulted in short term, reactionary responses, as discussed in Chapter 2. Accordingly, that, dependent on if the council was directly affected by an event, following the passage of time the interest in risk management waned to the point that it no longer from part of the agenda. In the instance of an affected council, the closing question from governance was to enquire if insurance arrangements were up to date and adequate. If the response was satisfactory, then elected representatives were happy enough that there was not much more that could or needed to be done. In a broader context, the New Zealand government’s institutional response following a natural hazard event is inclined to focus on the specific type of event that has just taken place. An example of this is the amendment to section 101B of the Local Government Act 2002 following the Christchurch earthquake series which legislated a shift in focus to provide for 30-year infrastructure planning in order to address natural hazard risk.

In summary, emergency management was found to be a largely reactive practice. This seems to be embedded in the blinkered focus within the institutional framework and the combative nature of discourse by governance which are subject to a limited window of time following one-time natural hazard events. As a result of this, emergency management practice in the sense of long-term risk management, is greatly restricted by the institutional framework within which it operates.

7.3.4 Elected Representative Practice

Decision making by locally elected representatives was found to be profoundly influenced by the provision of guidance and recommendations of external professionals. An environment was described by a Nelson City Council elected representative of “low-to-medium trust” of administrative officials in regards to the information provided for decision making and a “tendency to provide a rose-tinted picture” in their response to questions. As previously discussed, this correlates with the finding of administrative officials only providing enough information in order to obtain a decision, describing a situation where data and uncertainty becomes reduces to a line on a page or a single number (White, 2019). This lack of trust does not provide

a great platform for considering complexity, and instead, elected representatives are looking increasingly to information and assurance from experts external to their council. This section, therefore, will discuss elected representative-centric matters that could have an effect on decision making practices concerning long term dilemmas of uncertainty. It also addresses how a self-governance mode (versus a networked mode of governance) affects decisions as well as the identified practice issues regarding interactions between actors within the organisations that they have been elected to govern.

Uncertainty and long-term risk management of infrastructure in the likelihood of increased extreme weather events and natural hazards arising from climate change emerged from the workshops and interviews as the priority matter for decision makers. However, discussions with a number of elected representatives indicated that they were not acutely aware of this. One elected representative who was aware proposed that a reason for this could be that in the main, elected representatives have little to no exposure to the detail behind planning procedures (for example), and assume that most of these decisions would be business as usual and thus made by administrative officials. Elected representatives are therefore not exposed to or included in the risk management discussions taking place at a practitioner level and viewed their role as approving, most commonly, the finances required to take the next step in the risk management process. To further illustrate this gap, there was some evidence of a lack of understanding of the effects of climate change and, in some cases, elected representatives were reluctant to make formal decisions on the matter due to the belief that is no such thing as climate change. In one instance, a council member even accused the media of "… bending scientist's comments to invent something else to scare the public with". Coupled with the awareness that inaction in the short term may lead to questions of negligence, the lack of firm signals as to the timing, magnitude and extent of the damage likely to be caused by climate change compounded the 'fact' accepted by some elected representatives that there is little evidence to support the notion of climate change. Seemingly, this is a view shared by the former deputy leader of the National Party, Paula Bennett, who declared that the prospect of climate change is "ridiculous and rhetoric" (Small, 2019).

The term ‘uncertainty’ was taken by some elected representatives to simply mean a situation where there was a lack of, or an irregularity in, information. It was understood by the elected representatives that it was the role of local government administrative officials to provide them, in their governance and decision-making roles, with sufficient and reliable information by which they could govern and make sage, informed decisions. However, given that they were subject to a short-term 3-year electoral cycle which all were hopeful to extend, most were described a nervousness about making significant, long term decisions. In many instances, the preferred course of elected representatives was to defer the decision, as described by one elected representative;

> In a situation where you have to make a tough decision which you know will be controversial in the community whichever way it goes and the election is in sight, its best to just wait. It’s important you realise that none of us want to get it wrong, but also, we don’t want to be known as the councillor that approved such-and-such. Of course, we want to remain voted in. In all honesty, we’d normally find a critical gap in what we are being told from what we find in the reports and will have to ask the manager to go back and find out some more information to fill that gap. I’ve known this to take weeks if not months to resolve in some cases.

This describes the dilemma of elected representatives defending their position and reputation within the organisation and their standing in the community against making poor or wrong decisions based on limited options and information presented to them by actors with imperfect knowledge. Elected representatives reported their concerns that, ultimately, natural hazard events on the scale of the Christchurch earthquake series were a nation-wide problem and were of the view that all levels of government were stakeholders and so the associated costs to risk management should be allocated accordingly. As such, there was commonality in the opinion that a coordinated approach to hazard risk management on a national scale would be likely to achieve positive and consistent results in time. In addition, there were some calls for discussion to be initiated in regards to who should pay and how much for the information clearly required to begin to make meaningful decisions. This concern centred on the view that no individual council has the financial means with which to invest in the continuous need for information in a changing environment. It was considered that rates contributions should be reserved for delivering the range of other

vital services as part council's daily functioning - and so central government would need to assist.

In summary, the decision practices associated with natural hazard-related risk management were found to tend towards avoidance in the arena of uncertainty and risk management. While there was acknowledgment by elected representatives that their role carried responsibility, there was in general a low level of understanding as to the significance of climate change and the effect that this may have on government owned infrastructure and/or the associated decisions that they made. To an extent, the reason for these shortfalls were in relation to the lack of confidence and constraints in information and options offered by administrative officials in the absence of a national appraisal of the natural environment with external contribution. However, as a result of a lack of investment in sector specific data, producing such an appraisal is likely to be costly and there were concerns as to who should pay and to what extent, given the local financial constraints. This indicates the need of a cross-institutional framework/networked approach.

7.4 The Adequacy of Decision-making Practices

7.4.1 Risk Management Profiling

A risk profile is the quantitative analysis of the types of threats that an organisation faces (ISO: 31000). The establishment within the institutional framework pertaining to the review of plans and information was largely inadequate in articulating changing risk profiles, due to the static 'snapshot-in-time' nature of the data. Driven by the short-term nature of the costs associated in obtaining up-to-date information, the long-term risks and costs can only be passed on to future communities. Time is an important consideration within risk management and with this short-term approach to data and cost, decisions that are hinged on the ability to anticipate, predict and proactively identify change in course become limited and, for the most part, misinformed.

Officially, data and information are governed by two agencies: Land Information New Zealand is responsible for data relating to land titles, geo and hydrographic information; and Statistics New Zealand maintains official statistics and environmental monitoring which includes some climate change indicators. The respective agencies and local governments hold information in accordance with set principles, however in the absence of a central repository where new information can be added, risk

management is uninformed. As previously discussed, when information is maintained in isolation, locally gained data is poorly linked to that owned by central government with the consequence of an inadequately developed national understanding of risk which culminates in the inability to understand and model the potential future costs associated with it.

As virtually every local council used different consultants to assess the risk associated with their respective territory, a different approach was subsequently undertaken in each instance. Inconsistency of data and its application was a consistent theme derived from this fragmented approach to information management on a national level with only some consideration given by decision makers as to the value that a central repository of information maintained by central government could offer. The consistency and accessibility of information that is so vital to risk management decision making under the current conditions is therefore considered inadequate.

7.4.2 Adaptation

Following on from the above, the practice exhibited difficulties in the experiences of the practitioners in conveying the possibilities of changing risk to elected representatives as a means towards advising about the building of adaptive design procedures within the institutional framework.

> "There's no set of rules or instructions so we do it the way it works for us to think about the problems that we face, but it is only year by year – that's all we can really afford. I know this is the same story for the neighbouring councils too".

Described by a local government risk manager, this supports the previous finding of a piecemeal, tailored approach to risk management, certainly on a regional basis. Again, this includes a short-term focus, again highlighting funding restrictions and the consequence of this is that adaptive risk management has not been adequately instilled in institutional practice methods. There are exceptions from the trend, however, and this includes councils located in recent natural hazard event hotspots such as Wellington and Christchurch where a wider view has been taken of some risk management decisions. "We are spending a lot of money so we need to make sure that the arrangements and improvements we make now should stand up to similar

events" (Wellington Council). The actor was unable to divulge the details and costs of the activities, but from the quote, it can be understood that there are instances of adaption but appears to be confined to councils that are more regularly affected by natural hazard events. For the majority of other councils that are rarely exposed to events, this provides a clear signal that it is likely to be difficult to change course in the future. Furthermore, if there is the possibility to shift, it will probably come with high financial transition costs. To further compound this problem, as noted in Chapter 5, the inconsistency of the timeframes offered within the statutes are uncoordinated further adding to the complications of communicating changing risk profiles over time.

7.4.3 Risk Approach

As previously discussed, the council measures that are designed to approach progressive risk decision making are largely inadequate over the long term, largely due to the static, snapshot-in-time nature limiting risk approaches and decision making largely to an annual window. Expectations of decision makers are set by this information which will ultimately lead to decisions which are described as having a trajectory that will be expensive and difficult to deviate from. Still, participants observed that these processes do provide an understanding and approach to risk, even if they are disputed when utilised. At present, the focus of practice is on strategies designed to deal with risk via emergency management and on the standing methods that entrench risk; for instance, rebuilding in areas not exposed to risk, and stop bank flood control in high risk areas (Reisinger et al., 2015). This was further elaborated on by one local government executive who expressed the experience that the institutional framework and its quasi-legal processes were "strangulated" by the level of precaution in approaching and understanding risk. Given the demands for data by governance to substantiate decision making, this is found in the main to be historic and/or unfunded and as a result, this trepidation on the part of the decision makers due to a "lack of evidence". The failings to meet the requirement for evidence and substantiation leads to conservative culture of decision making (White & Nandedkar, 2019), and is supportive that a risk-based approach to decision making is minimally utilised at present.

The approach to risk management - and therefore organisational learning - has been found to be somewhat hindered by a general lack of strategy linking local, regional

and central government within their risk management functions. As previously discussed, some headway is being made in the scenario planning of existing risk between risk practitioners, but otherwise risk is managed on a council to council basis with an introspective view that co-exists with self-governance. One regional council risk manager stated that for the past six or seven years that the sector has had any formal risk management arrangements this situation has been the status quo. The same respondent reported that talking about a council's risks with practitioners from another council was frowned upon by governance due to "fear of the media finding out about it and we're told not to do our washing in public" (Regional Council Risk Manager). As a result, risk is usually discussed within audit and risk committees in public- excluded meetings.

Separate to formal risk management practice, some integration was identified between hazards and asset management. These examples of practice were within one large local government organisation and included engineering and emergency management laying the foundations to link known natural hazard risks with civil defence plans with the intent of forming robust plans to reflect financial investment and, ultimately, governance approval. An anecdotal comment was made by a regional emergency management professional of plans for their regional council to work with the neighbouring district council in order to construct a region-wide natural hazards register. The driver for this exercise was to of identify cross-boundary hazard risks, but to also include climate change as an agent likely to negatively magnify and/or expedite the known hazard risk environment.

These examples demonstrate both an identified need - and a capacity for - networked integration across the institutional framework. Described as in its infancy, this coordination is beginning in small pockets. However, a far greater, more organic approach is going to be needed if the approach to organisational risk learning is to be developed on the scale required to support long term risk and influence elected representatives who have been described as nervous of making the wrong decision.

7.4.4 Risk Management

Following the approach of understanding risk this leads to considering how it may be controlled. A general theme from the risk practitioners interviewed in this research is

that the current practice of risk management across local government is entangled in competing evidences of complex risk modelling and professional judgments, which can better incorporate uncertainty. This is described as perpetuated through the institutional framework - as previously discussed - through inconsistent data and short-termism, but also the way in which the courts are becoming the default decision makers. Specifically;

> *"Elected members always find it difficult to execute new strategies. The reason why is that they don't know how to escape the day-to-day operations. The goals they set for moving the organisation into the future are a priority, but when urgency and priority clash, urgency wins every time."* (Local government senior risk practitioner).

Given the identified absence of central government in risk management discourse and the reluctance on the part of local governance, the courts;

> "… have been left to work out the meaning of decision making around risk management because [of] legally orientated direction which filters down to create and/or inform regional and local rules are missing from the equation." (Senior planner, local government).

This finding opens up a new avenue of discussion in regard to the environment that the courts find themselves in. This consideration is driven by a comment made by a local government risk practitioner as to the 'tolerance' of risk. Risk tolerance is an important facet of risk management and relates to the amount of risk that a party is comfortable in taking, or the degree of uncertainty that they are likely to be able to handle[11]. Risk tolerance considerations are not a feature of the RMA, although it is mentioned in the purpose of the Civil Defence and Emergency Management Act 2002 (Section 3(b)). Acceptable risk at a conceptual level is grounded in risk perception (Fischhoff, 1984) and is a practice that has been adopted by the courts following its mention in a natural hazard setting within the Civil Defence and Emergency Management Act 2002. However, the questions posed by a local government elected representative highlight confusion about risk acceptability: who should the risk be

[11] N.B., this should not be confused with risk 'capacity' which concerns the amount of risk a party must take on in order to achieve a goal or objective.

acceptable to? Is it the current or future community? In considering these questions, it could be suggested that judgements on what is measured as being of future acceptability or tolerance could be nothing more than conjecture and, therefore, poor variables as a means of risk planning for the future.

In regard to the management of uncertainty across governance scales and functions, interview data suggests that while councils continue to operate in isolation, decision making is likely to remain constrained. This point is illustrated by a comment made by a Hamilton City Council risk manager in discussing the Waikato LASS arrangements;

> "Hamilton have a larger rate base, therefore more money, and would pay more [towards the shared cost of insurance] than, say, Waikato District. Once the smaller councils are part of something like this, all of a sudden, they have options. Take Otorohanga. They are massively flood prone and through this joined up approach, they can afford more, have more choices".

This point is validated by a Nelson elected representative who stated, "of course there is more we could do and more we would like to do in the risk management space, but there is only so much money in the pot".

Proposals for the amalgamation of regionally located local councils in New Zealand are made periodically, but without consistent success[12]. Barriers to the success of amalgamation proposals are commonly connected with concerns about the loss of identity of individual councils and reluctance on behalf of elected representatives to share or yield power (Rigby & Robson, 2016). However, one local government executive posited that if power could be pushed lower down the agenda, the blending or removal of jurisdictional layers within local government would greatly assist in creating the consistency needed in the approach to the management of long-term risks. The best example of consistent regional standards - certainly regarding infrastructure asset management - is within Auckland Council and the CCO Watercare arrangement which carries no reinstatement insurance with the cost found to outweigh the risk exposure. However, we are reminded by a senior planner from the South Island that the Watercare arrangements have not yet been fully tested in a significant event and

[12] Including Tasman-Nelson in 2012 and Hawkes Bay in 2015

it remains to be seen if their risk assessment is robust. However, the Water Care model is one that is based on complex collaboration between stakeholders and is therefore noteworthy.

In sum, these observations identify an area of opportunity for local government in the form of linking institutions towards greater consistency in risk management approaches. There are certainly indications that if a successful design can be created - or alternatively, directed by central government - then a collective approach could assist in leveraging change. For instance, section 31(1) of the Local Government Act (2002), the Local Government Commission notes that collaborative relationships are key to Auckland's success and rely on all parties understanding how and where they fit into the local government system, mutual respect and clear communication on all sides. Insofar as the governance framework, this contributes to the balance of regional and local needs without losing the benefits of being part of a large organisation and allow service delivery standardisation and where service delivery could be tailored to different areas. This would be reliant on regional and national policy, as well as buy-in by actors and governance. Although not yet fully tested under conditions of a significant natural hazard event, the collaborative approach to the Auckland model certainly provides a template worthy of future consideration.

7.4.5 Adaption

The course of adaption through experimenting with information-based scenarios and learning from these outcomes as well as the experiences of others is an important facet of risk management. There was a good deal of evidence that this behaviour is happening in practice across the framework through, for instance, knowledge sharing of the outcomes of testing towards the building of a bigger picture of a universal, flexible practice to influence decisions. As a result of this, networks have emerged between risk practitioners and there was much discussion as to the near-term plans to engage researchers to assist in the development of long-term decision making. This work was considered by a metropolitan council practitioner as in its early stages, but nonetheless, the sharing of knowledge is occurring - albeit in a small area - and holds the potential to yield wider consistency of practice in the future.

This 'self-organisation' (Pelling, 2011) approach by local and regional council risk professionals is a useful example of informal arrangements which are built and

maintained by individuals and require minimal financial investment. In their current format these networks are probably not enough to steer adaptive practices to long term risk management outside of the electoral cycle and/or carry the momentum necessary to instil change across the national framework. However, this is a promising start and, with the appropriate facilitative mechanisms such as leadership, finance and the linking of roles and responsibilities between different governance scales, the experimentation and learning evidenced would increase governance knowledge and decision-making options towards more positive results.

7.5 Summary

The interviews indicate an overall shortfall in understandings of climate change characteristics, how these can be used by management to exercise influence, and/or how governance can use knowledge and data in their consideration of long-term decision making.

The importance of considering risk management cannot be understated, particularly as the decisions around infrastructure can involve millions of dollars of expenditure and risks cannot be fully transferred to a third party. An example of this exists in the three water arrangements made by Auckland Council. As discussed in Chapter 2, Auckland has a council-controlled organisation arrangement (or CCO) with Water Care Services. Waste water and water supply services are maintained at arm's length via Water Care Services, while storm water services remain a council function. However, under the Local Government Act 2002, Auckland Council cannot shirk its statutory responsibility for all three of the water services. To assure compliance, a memorandum of understanding has been created which states the council's purpose, responsibilities and its expectations of Water Care. This is a particularly noteworthy arrangement as it fundamentally means that Water Care Services will make financial investment in the situating and maintenance of infrastructure in locations identified as likely to be affected by increased rainfall intensity. However, these investments will be influenced by decisions made by Auckland Council as it applies to storm water arrangements.

The risk management processes that have been adopted within the institutional framework are based on the principals of likelihood and consequence and therefore

reliant on static measures in order to identify, mitigate and ultimately control risk. In the absence of more sophisticated scientific-based approaches to predicting risk, the absence of hard evidence about a particular location has led to disbelief by some elected representatives - as well as at a ministerial level - that there is actually a pressing problem. This results in risk avoidance or at best, poorly developed evasive decisions which ultimately compound the lack of understanding. The end result is that decisions that are made today lack in future orientation and are likely to be difficult or expensive to adapt in the future due to the restricted lifetime of the activities. However, administrative officials and practitioners are beginning to see value in breaking down the historic isolation of councils and much work is being done to address this through emerging coordinative efforts to gain knowledge and share experiences. Risk, therefore, becomes less framed in absolute terms and, although these arrangements remain informal and, in their infancy, information that could promote more flexible approaches can be shared and used to inform decisions about risk at a governance level.

If these incremental adjustments can gain enough investment and traction to be formalised, the need to address time and complexity can be addressed. Complexity - certainly in terms of data by which to begin to understand problems - can be confronted by the use of centrally held information which is up to date and accessible. However, the uncertainty of timeframes was found to be a confounding factor for decision makers. Natural hazard events are a near universal trigger point for the linkage of the institutional framework and the emergent practices identified in this research could support the adoption of more anticipatory and flexible practice. However, this window of opportunity is found to be short lived as those councils not directly affected by an event are found to revert back to normative practice after a short space of time.

Further themes that emerged from governance in relation to the arrangements for practice, again, speak of the fragmentation of functions. Notably, this was through the isolated style of leadership, financial constraint and the contribution of external expertise to decision making. These issues are not assisted by the current institutional framework and serve to widen the gap between practitioners/expertise and decision makers in the consideration of long-term risk management. This common response from many of the participants highlights a short term/arm’s length approach to decision

making practice by local governance. This blends operational and strategic activities to the point of a local government service delivery model which does not sit harmoniously with the requirements of long term, strategic planning. This illustrates a functional approach to risk-based decision making at a local government level, and it is noted that this is being done efficiently. Operational success has been identified as a key driver of governance towards the opportunity of re-election on the basis of community viewed performance. This factor appears to dominate overall decision-making practice and thus, overshadows the long-term strategic considerations that apply to climate change risk management.

The trend of individual councils obtaining advice from different sources – and therefore based on differing approaches - is found to result in different assessments of risk. The risk of this piecemeal approach to information gathering for the purpose of decision-making is that the advice can be contradictory. The call by practitioners for collaboration and engagement processes was made clear throughout the results of this research. These processes have begun in earnest, but are not yet embedded in practice meaning that the arrangements are being tested reactively. While evidence of positive attempts being made towards developing a centralised bank of data (at least on a regional level) has been identified, at present information across the framework is largely maintained in silos. The assessment of a central government senior risk practitioner contributes the final words on the most likely scenario under current conditions: "… if these informal networks are not formalised by some sort of central government intervention and receive the necessary investment of finance and resources at a local level, then the arrangements will soon become unsustainable and will collapse".

To summarise the findings in relation of the modes of governance and their implications for addressing differences in time and complexity, as discussed in Figure 4, the findings it is acknowledged that there is a limited number of networks in place, and a tendency towards hierarchical and self-governance. In terms of the more hierarchical approach, this is evidenced in the top down decision making and the management of risk through existing controls as opposed to the research data driven lens of a more networked approach. In terms of self-governance, central government have described a tendency for councils to act with more autonomy in what has found

to be their individual approach to interpreting policy and rules to fit within their own budgets, knowledge, skills and local environment. Interestingly, this portrays a hybridised approach to decision making, and clearly one that has been evolved by governance to do what needs to be done: make decisions. In consideration of Figure 4 and the literature that has formed the model, this allows consideration of more simple and complex problems. However, this finding is also supportive of the wider theme of the timing of decision making, in that these modes of governance are geared towards the short term as opposed to the long-term view required for the futureproofing of infrastructure.

Chapter 8 - Addressing Fragmentation, a Lack of Coordination and Short-termism

8.1 Introduction

The purpose of this chapter is to consider decision-making practices within local government in relation to the conceptual modes of governance depicted in the matrix developed and outlined in Chapter 3. The chapter also addresses objective three of the study concerning the types of governance arrangements and decision-making practices that have potential to be implemented across local government in order to improve long term risk management decision making.

8.2 Current governance and decision-making arrangements across local government

This research has reviewed the current governance arrangements and decision-making practices across local government and revealed a number of barriers to taking longer-term considerations into account in risk management decision making. As the analysis has progressed, the focus has come to centre on the challenges of managing complexity and on significant issues relating to fragmentation and capacity. Additional challenges have also been identified with regards to the organisational culture within local authorities and a series of tensions arising between central and local government. Drawing on the matrix as outlined in Figure 4, this may be understood as reflecting the dominant approaches to risk-related decision making, particularly the difficulty in grappling with issues relating to the dimensions of complexity and time. The purpose of this chapter is to discuss the findings in answer to the research objectives. A series of recommendations designed to enable deeper engagement in addressing these challenges are introduced in the last part of this chapter.

Briefly, the challenges to effective decision making, as identified in Chapters 6 and 7, were:

- An isolated approach to understanding the local hazardscape through a sporadic and unbudgeted approach to research;
- Fragmented decision making across councils, some of which is based on inconsistent information provided by central government; and,
- A tendency by government officials to distil complex risks down to simplified information to decision makers in accordance with bureaucratic norms,

leading to the ‘cherry picking’ of options by elected decision makers through fear of contention/public perceptions in order to remaining elected.

The current risk arrangements, as outlined in Chapters 5 and 6, and in relation to the long-term management of council-owned infrastructure, are predominantly delivered as a core requirement under the Local Government Act 2002. As explained in Chapter 3, this requirement can be summarised as the enablement of local democratic decision-making and action by (and on behalf of) communities in order to meet current and future needs (Local Government Act, 2002 s.10 (1)). The Local Government Act 2002 also stipulates the requirement for, and provision of, quality infrastructure and, through strategic long-term plans, where the authority must identify significant infrastructure issues and how they will be managed through financial investment, maintenance, risk management and insurance in consultation with their communities. We can see the influence of this Act upon local governance decision-making practices and cultures – there is clearly a mandate to act, but the data reveals that the ways this is delivered can be open to interpretation. For instance, Wellington City Council recently announced plans to spend up to $3.6 billion to upgrade and build water infrastructure to support estimated population growth over the next 30 years. However, the available council budget is $2.7 billion for water pipe maintenance and upgrades over the next 10 years, as well as up to $208 million on the required upgrades to the associated wastewater treatment plant, it is unclear how the available funding would be able to cover the proposed upgrades (George, 2021).

The purpose of the Local Government Act 2002 is to empower local government decision makers and enable, in this instance, decision making towards the long-term risk management of underground infrastructure. The findings in chapters 5 and 6 identify shortcomings in the purpose of the Act and, when considered against the model introduced in Figure 4, provides insights into the ‘real life’ operationalisation of these governance arrangements and decision-making practices and the implications for long term risks like climate change, particularly in terms of power, scale and approach. The following section describes how these current arrangements can be considered in the context of Figure 4, specifically in terms of the current modes of governance being utilised and the ability to manage risk, time and complexity.

The findings of chapters 5 and 6 portray an environment in which short-term decision-making norms and practices are failing to respond appropriately to the challenges posed by complex long-term problems. The net effect is adequate risk management from a process perspective, but inadequate risk management processes and decisions regarding the nature of science and risk and the end outcomes – in simple terms, an inability to cope with uncertainty and complexity, inflexibility and lack of adaptability. The following analysis extends the discussion of these issues by integrating and developing the links between the existing governance arrangements and poor decision-making in relation to long-term risk, before we turn to the recommendations.

8.3 Barriers to achieving a longer-term perspective in risk management decision-making

The governance challenge of balancing short and long-term decision-making pressures in a way in which both local councils and their communities can thrive was identified throughout Chapters 5 and 6. The following subsections will now integrate and summarise the key challenges to be picked up in the recommendations.

8.3.1 Challenges in Managing Complexity

While an acceptance of uncertainty is implied within the current practices outlined in Chapter 5, it is acknowledged that transformations in the risk profile over long timeframes struggle to be predicted and mitigated, although there is some provision for post event reaction within the Civil Defence and Emergency Management Act 2002. While contemplation of change is not entirely eliminated, it is difficult. In practice, it is reliant on the methods utilised to influence decision-making and the quality of guidance available. However, given the lack of central government guidance and involvement in how the policy settings relating to complexity and uncertainty are enacted at a local government level, this environment largely leaves locally elected representatives to decide what the decision making and ensuing arrangements will be and how they may consider complex issues.

The data revealed that the institutional arrangements for risk management were unsuitable for the management of complexity in three keys ways: in terms of enabling management of the scale and severity of impacts; the uncertainties associated with the timing of impacts; and in terms of meeting the costs of mitigation. These are all

key issues for Local Government, which has limited resources and a need to spend wisely.

Looking across the three issues, it was clear that there was limited knowledge of future risk within local government, this reflecting a lack of expertise in the assessment and management of risks among both administrative officials and elected decision makers. This may be partially due to the low investment and isolated approaches to understanding the current and future local hazardscape, as described in Chapter 6. This approach also restricts the application of more anticipatory forms of governance. The situation is similar to that described by Boyd et al (2015, p. 156) where, without knowledge and expertise of the natural hazards and the threats they pose, ‘‘the whole picture is not grasped. You don’t have the time. It is too big. You have a given specialty, but you can’t keep track of the whole picture’’ (Boyd et al., 2015, p. 156). Given institutional limitations within local authorities that make it difficult to see ‘the whole picture’, elected representatives tended to prefer advice from external ‘expert’ sources outside of local government, which could deliver information in simple, accessible formats, where budgets allowed, and allow decisions to proceed. While it is acknowledged that the pace of climate change and the subsequent effect on the predictability of natural hazard events is changing (Elsen et al., 2020), the variability between regions makes risk forecasting a very uneven and inconsistent process.

8.3.2 Challenges Arising from Fragmentation

We can now begin to appreciate the links between the different challenges, and how they may be considered in relation to governance. Local governments do retain some power in relation to long-term risk management via their individual Long-Term Plans. However, this is illustrated by the fact that different local governments tend to act in isolation, whether in terms of understand the risks, the processes for managing scientific uncertainty, or the ways to manage complex policy trade-offs. This was also the conclusion of the Department of the Prime Minister and Cabinet New Zealand (2019) inquiry into central government engagement with local government that found that many local authorities *‘‘see themselves as autonomous bodies” (p29).* As described in Chapter 6, the tendency in councils to maintain a strong, and perhaps parochial local identity, contributed to their tendencies to retain significant decision-

making autonomy. This, therefore, contributes to decision making being more isolated and variable in different localities.

The Local Government Act 2002 requires councils to maintain local infrastructure in order to meet the current and future community needs. This is to be achieved, in part, through strategic long-term plans where the authority must identify threats to local infrastructure and indicate how they have futureproofed them through financial investment, maintenance, risk management and insurance. However, the Act does not stipulate the ways this should be done and/or the quantum of financial investment in future proofing. Chapters 5 and 6 found that councils were working relatively autonomously and, as a result, there was a propensity for each local authority to interpret the legislative requirements differently. While this provides for responsiveness to different regional risk profiles, it also means that many local authorities operate in isolation, even when risks are shared across local authority areas. The research also identified instances where councils were working more closely together. In these arrangements, locally clustered councils had the benefit of learning from neighbouring councils in risk management decision making, as was described by a risk professional in a Waikato-based council;

> "Being a LASS member council, but also being in close proximity to a main centre council and a more rurally orientated council gives us a good opportunity to cross pollinate in terms of risks, particularly what approaches are being taken. This probably allows us to reflect on our own plans to see if our thinking is any better or if there is something we might have missed".

Councils without the tradition of working together on issues, such as transport, were found to carry increase variations in approaches to risk management, particularly in environments with little central government oversight or moderation. The instances of collaborative practice were very much ad-hoc responses, they were not a legislative requirement, and they were not typical of risk management across the local government sector. Instead, the overall approach to risk management was fragmented, driven by local decisions made in line with local capacity and the availability of funds. Within this context there was a limited range of possible flexible adaptive measures, and it is understandable why there was a focus on short-term decision making. However, the outcome of this behaviour was the propensity for councils to be event

reactive with heavy reliance on central government initiatives such as the 60/40 insurance arrangements.

Another factor relating to the tendency for local government to make decisions in isolation was that a reluctance to give up local power led to a parochial focus - a local orientation that reinforced an inward-looking culture and an inability to take account of broader regional and national perspectives that issues like climate change presented. This, of course, is problematic when it comes to long-term natural hazard-related risk management which does not map neatly onto administrative boundaries. There has been historical evidence of some coordination across central government departments, which included situating the development of climate change policy within the Department of the Prime Minister and Cabinet in 2001 (Ministry for the Environment, 2016). This has led to a dedicated 'climate change office' within the Ministry for the Environment which is tasked with the introducing and managing climate change policy across the public sector. This arrangement was disestablished in 2005 with the portfolio fragmented between the Ministry for the Environment and the Ministry of Primary Industries. However, a Minister for Climate Change was appointed in November 2020 with direct responsibility for the overall climate change policy direction at the domestic and international level. The Minister is responsible for the New Zealand Emissions Trading Scheme along with an advisory climate commission (Beehive.govt.nz, 2020).

At a local level, the sporadic LASS arrangements found within the North Island continues to instigate the coordination of risk management arrangements, albeit only on a regional basis, with no evidence of a similar collaborative model emerging on the South Island and/or on a national scale. It should be noted that there is good knowledge sharing occurring through mechanisms like Local Government New Zealand, but it would be useful for this to be more formalised, and supported by appropriate advice and guidance.

8.3.3 Challenges relating to Capacity

At the local level the research revealed there was a low level of comprehension by the elected representatives about the long-term significance of decisions with regard to managing risks, which was related to three key factors. The first of these was the

fragmented and inconsistent nature of risk data. If we are to expect appropriate long-term risk management actions by local government, they need to have access to relevant evidence using consistent terminologies and thresholds. The research found, however, that there was conflicting guidance about how to approach long-term risk from central government, and a lack of funding by which local authorities could procure their own, more granular, data. The second was a reluctance by local administrative officials to present meaningful and ambitious risk management policy options to locally elected representatives on which to base decisions, given their limited knowledge and data. Finally, there was a tendency on the part of elected representatives to be cautious about acting on the options presented to them through fear of creating local controversy, through uncertainty of the impacts of decisions, the implications on costs to ratepayers, or from public backlash, and all of this being interpreted through a lens that was focused on the triennial election cycle.

As previously discussed, the inadequacies in the ways information about long-term risks were shared is a key barrier to understanding the scale, severity and timing of risk and its dynamic nature. How these long-term risks were framed influenced the way that elected representatives responded. A range of differing positions and perspectives of the seriousness and immediacy of natural hazard risk by those in decision-making positions was observed in the research. These positions ranged, on the one hand, from a real desire to prepare for an uncertain future to, on the other hand, those who did not believe that climate change actually existed. This could be seen in comments made by some reach participants regarding the connections between climate change and the increase in number of natural hazard events, such as in references to “bending scientist’s comments to invent something else to scare the public with”, and "ridiculous and rhetoric". These comments reflect the wider systemic problem of a lack of relevant expertise among elected representatives and, to a lesser extent, a shortage of useable and up-to-date risk-related knowledge and data. While there was a ‘generalist’ level of risk-related knowledge among administrative officials, external experts were the preferred source of natural hazard-related advice.

Local government plays a critical role in disaster risk management through the approval of adaptation strategies by elected representatives and the implementation

of coordinated administrative action, but the capacity to act on that varied across local authorities. It was found that in some cases administrative officials did not, or were unable to, acquire scientific information that could be used to better understand local environmental threats and hazards, and that these barriers to adaptation formed a significant problem for local authority respondents. In many respects, the 'right' kind of information in the right format was missing. The lack of investment in research and a lack of capacity to broker that scientific knowledge into quality, accessible information to inform decision-making, has contributed to the underdevelopment of adaptive capacity across councils. Local authorities were found to face substantial difficulties in the implementation of longer-term adaptation plans as well as winning the argument for changed strategies. Budgetary constraints and the lack of both in-house and central government political support were largely responsible for the diminishment of institutional capacity, underpinned by the low political appetite to address long-term risks in favour of the delivery of immediate statutory/community responsibilities.

Therefore, communication is identified as an entry point by which to better frame risk. Communication that presents knowledge relating to risks alongside the tools required to approach decision making can assist in the translation of risk and uncertainty into a feasible practice. Transformation towards such a path requires not only expertise and technological innovations, but also adaption to the kinds of organisational practices able to address the complexities of contemporary problems (Grin et al., 2010). However, change of this nature can be a long-term practice (Grin et al., 2010) and will require fundamental changes in attitudes to risk and modifications of the institutional culture, including management expertise and reporting, and acknowledging those decision makers who lean towards a lack of interest or understanding of complex problems. It may also require central government support or guidance concerning related aspects of risk communication best practice to ensure a consistent national approach.

Significantly, inconsistencies between relevant Acts and central government guiding documents do not assist in this matter. The analysis in Chapter 5 identified disparities in directives relating to flood planning for rural and urban councils. The result is misalignment in approaches by different councils to the same cross-boundary problems, leading to fragmented approaches to risk management. This means that

the potential for collaborative, integrated risk planning is undermined. Given that these differences in policies were highlighted in the interviews with risk management practitioners, it was clear that the issues were well known by elected representatives. Looking ahead to as yet not compulsory initiatives, such as New Zealand's transition to low-emissions and climate-resilient Aotearoa New Zealand programme (Ministry for the Environment, 2020b) the lack of requirement for coordinated action enables decision makers to 'cherry pick' the timing and subjects that they avoid or prioritise. Fluoridisation of the local tap water is another example of this[13].

Obstruction through the avoidance of topics were found to be constant throughout the decision-making practice within local government elected representatives. There were degrees of evasiveness in relation to acknowledging climate change displayed by elected members of local government, along with the lack of capacity to understand the effects of climate change and/or a reluctance to accept it. Furthermore, there are ongoing tensions within local government arising from calls by central government for more tasks and better integration, without the resources to deliver that.

8.3.4 Challenges arising from organisational culture

Risk management was found in Chapters 5 and 6 to have become a normal practice within local government decision making, but it was approached in a very traditional manner and to varying degrees of sophistication. Tradition in this respect typically involved a 'black and white' approach to risk assessment grounded in 'likelihoods and outcomes' based on the ISO: 31000 risk management standards. This approach tended to be applied in all risk scenarios - whether that be short-term operational risk, or long-term risk such as risks presented by climate change, and was closely linked to the guidelines of the ISO 31000 standard. These guidelines, being audit friendly, had the effect of shaping risk management practice within local government. Without enhancement or innovation, they led to what could be described as simplistic approaches to risk-related decision making, as illustrated by a comment from a local government risk manager:

[13] The addition/removal of fluoride was a controversial and heavily debated item at Hamilton City Council in 2013. A public referendum was held which was 70% in favour of the addition of fluoride, however then Mayor, Julie Hardaker still deferred the final decision until after the local election (in which she was re-elected).

"There's not really any point in implementing more up-to-date, dynamic risk management techniques as it's just lost on the councillors – they just want to be told if something is a high, medium or low risk, and what we are doing about it. That's it."

As evidenced in Chapter 6, new informal networks were forming which helped drive a greater appreciation of the need to take account of wider regional dimensions of risk management and hazard planning. These networks were informal, consisting of groups of two-or-three local government risk professionals meeting to discuss common problems. The groups had no structure, power or mandate, and received no funding. They were simply likeminded individuals who met to share knowledge and experience, as described by a Waikato-based local government risk manager:

"There are three councils close by. I am a full-time risk manager; the others have risk management as part of their substantive role. One is an engineer, for example. The three of us get together maybe once a month for a coffee and just talk about what is on each other's risk registers. I'm not sure about how the others, but catching up definitely helps me in my role. That we are doing a better job on mitigating a risk than the others if nothing else".

Information sharing, then, was carried out in an informal way to assist individual risk managers. There was an absence of any established professional framework to improve risk techniques in local government, and this contributed to a lack of knowledge exchange among both administrative officials, and elected representatives who live in a more short-term political world, as they 'try to reconcile the demands of openness with the demands of their existing political world (closed preferences, agenda driven, and control)' (Hendriks & Grin, 2007).

There was also a view that veteran elected representatives tended to dominate the local government agenda (Kemp et al., 2007). As a result, and as indicated in Chapter 6, councils have tended to maintain a range of short term, operationally orientated priorities. For example:

"There is no chance they'll make a big or controversial decision on the run up to elections. They don't want to get it wrong and lose votes." (Local government executive manager)

The hesitancy by decision makers to engage in what were described as 'legacy decisions' are a difficult issue for local councils to approach in isolation.

8.3.5 Challenges arising from central to local government tensions

Local government is required to carry out risk management activities, these requirements being stipulated in legislation passed by central government, and, therefore, by the political party in power at any given time. Given that central government is also subject to an election cycle, it was argued by some interviewees that this may inhibit long-term considerations as different governments bring different priorities.

Central government maintains that any change in priorities should not be problematic for service provision and decision making in local government as local government can be allocated the necessary powers in order to enable decision making accordingly (Department of the Prime Minister and Cabinet New Zealand, 2019). The 2019 DPMC report on central government engagement with local government stated that central government tends to devolve regulatory powers to local government for matters where it is considered important to allow local or regional communities to decide how rules will be applied locally, or how services are delivered through local democratic decision-making (DPMC 2019, p.20). While providing for flexibility, this allows for considerable variation in how the powers are exercised, and not necessarily with appropriate constraints. However, one MP responded with the opinion that:

> "If councils were to be given more power, then that should come with more accountability. The current levels of accountability are nowhere near high enough at the moment and therefore I'm unsupportive of such a move" (National MP).

Subsidiarity is a principle that maintains that matters should be managed by the lowest possible competent authority (Daly, 2010). It implies that local government is the appropriate level of government for risk management decision making, including decisions that relate to climate change adaptation[14]. From this perspective, decisions

[14] Some scholars have also contested this assumption, for instance Conway, D., & Mustelin, J. (2014). Strategies for improving adaptation practice in developing countries. *Nature Climate Change, 4*(5), 339-342. in the context of developing countries.

should be made at a local rather than central level, but strong central support is still needed in the areas where barriers have been identified. The reality in practice of subsidiarity is a mismatch in the power to act and the associated politics, capacity and finances. Finance is a particular barrier to networked opportunities. For instance, the newly formed regionally coordinated arrangements within local government to share information were specifically described by the participants as 'informal'. The fundamental reason for the informality of the arrangement is the complete absence of budget provision by which to fund the arrangements going forward. There are also significant competing budgetary objectives, such as those related to providing the new infrastructure to enable growth and to keep rates at a reasonable level.

8.4 Summary

In summary, four main barriers to effective long-term risk management have been identified:

- the inability of local councils to manage complexity associated with uncertainty about the timing and severity of risk events,
- the fragmentation of council risk management and a tendency for councils to make decisions in isolation creating inconsistency in the approach to risk management,
- the limitation of decision-making capacity through limited natural hazard information and a lack of associated subject matter experts in local government,
- a short-term orientated organisational decision-making culture, and tensions through devolved responsibilities to local government, but inconsistency in central government policy and oversight to bring about consistent application of risk management practice.

These findings combine data from Chapters 5 and 6, and essentially highlight the lack of coordination in the distribution of risk knowledge and best practices and the tendency for an isolated, self-governing approach to risk-related decision-making, which focuses on reactive approaches to long-term risk management. More generally, this raises questions about the institutional framework through which decisions for long-term risk management are made. There is, therefore, a strong argument for a need to enhance adaptive governance (Klinke & Renn, 2012) and anticipatory governance (Boston, 2017) - both of which could assist in

supplementing the existing institutional framework and decision-making practice. Problems like these, which are both uncertain and complex, however, mean it is more than a governmental endeavour. For example, in a New Zealand institutional setting, both Glavovic (2014) and Hanna et al. (2021) proposed that public and stakeholder deliberation can build understanding of different values and preferences where controversy and uncertainty is high, and build acceptability and tolerance where values and views differ, making it clear that governance responses will need to fit the nature of the risk problem. These observations are summarised in Table 6.

Table 6: Summary of the Barriers and Connections between the Framework and Practice

Barrier	**Framework** (chapter 5)	**Practice** (chapter 6)
Challenges in managing complexity	- Low/missing focus in policy that is geared towards decisions made based on certainty	- Traditional/limited approach to long term risk
Challenges in fragmentation	- Fragmented/individualistic approach to policies compliance	- Siloed, localised practice
Challenges of limited capacity	- Lack of integration of timeframes	- Reactive localised post-event approach - Gaps in capacity and capability
Challenges of organisational culture	- Siloed/underfunded approach to data gathering	- Inconsistent approach to data gathering - Limited options provided to decision makers

Turning to governance, the analysis in chapters 6 and 7, and the discussion above, reveals a tendency to approach long-term risk decision-making through modes of self-governance and hierarchy. Yet, the quality of the information associated with risk management varied considerably across councils. For instance, asset management plans record the age and condition of infrastructure (where known). In each instance, these plans were recorded in different types of software and in some cases, there

were no risk mitigation strategies. The finding that councils did not have uniformly complete policies on risk tolerance, risk management and risk mitigation agree with those of LGNZ in 2013, meaning little has changed in this time.

An end point of note would be that the discussion here is not applicable to every Local Authority in every location. There are examples of good practice, but the decision-making frameworks in existence and the ways they are interpreted provides a challenge to effective risk management on a national scale.

8.5 Towards a new Governance approach: using the matrix to respond more effectively to different types of problems

This section will discuss how the decision-making approaches matrix developed at the end of the review of literature (figure 4) can be used to understand and inform choices about appropriate governance arrangements and decision-making approaches. In order to do this, the modes suited to long term decision making, i.e. networks which lead to inclusiveness, responsiveness and less short-term decision making, are brought to the fore.

Figure 4 presented in Chapter 3 and re-presented below helps deepen understanding of the fit-for-purpose nature of current practices and how different kinds of public policy problems, such as those that are more simple or complex, or short or long-term, require appropriate governance frameworks. This is important to emphasise, as modern governmental action is largely seen and delivered through bureaucratic frameworks or structures and, in general, this model is more effective in structured situations where problems are more able to be framed and directed by single governmental agencies (Forrer, 2014). As discussed in Chapter 3, given the complex risk management nature of problems associated with climate change, effective governance frameworks tend to look to external agencies that involve a network of subject matter experts (Forrer, 2014) and which can also address problems of long-term uncertainty with communities (Hanna et al., 2021). This approach essentially requires more networked collaboration rather than traditional government hierarchy, if we are to better match the nature of the problem to the nature of the governance. In this arrangement actors are connected through relationships that are grounded in the development of reciprocal trust and factors such as mutual accountability. In contrast, the self-governance mode, was associated with greater isolation or a lack of scale and

fragmentation, and as contributing to a short-term focus, which would be compounded by other factors like the election cycle.

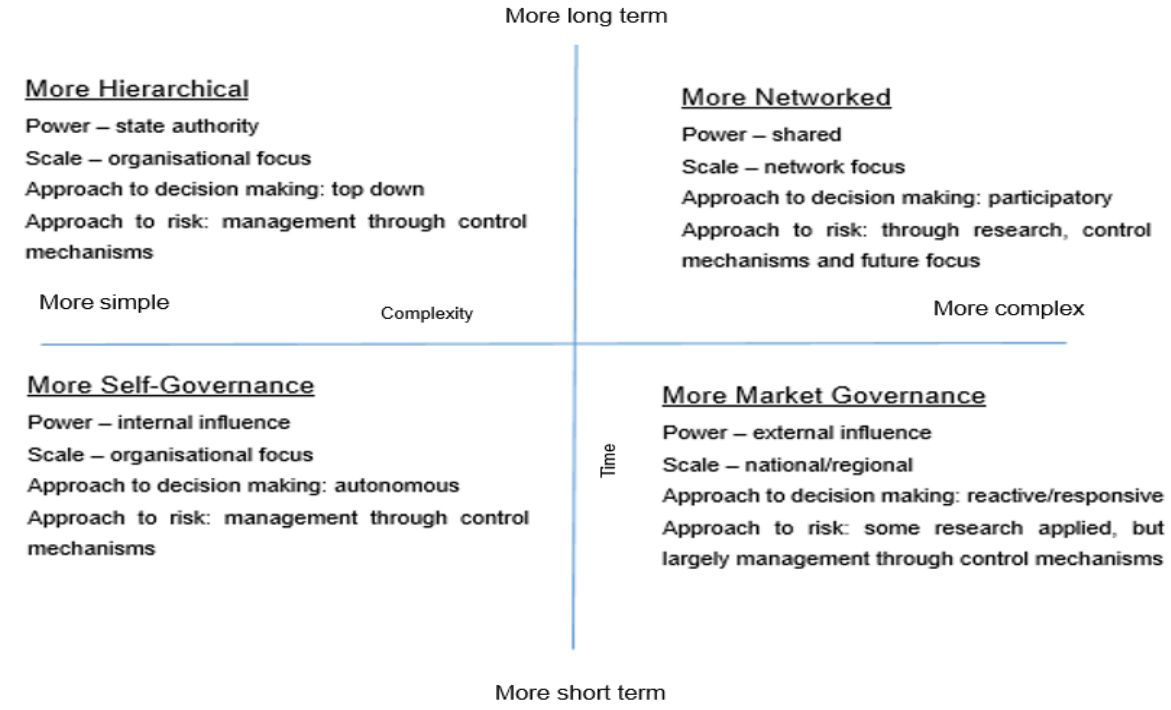

Figure 4: Decision Making Approaches Depending Upon the Nature of Risk

Biesbroek et al. (2013) state that many studies on adaptation to risks - such as those related to climate change - have primarily concentrated on barriers as if they were stationary and almost superficial objects, as opposed to conceptualising them as important facets of a dynamic governance process. This observation highlights the significance of considering the broad requirements of an institutional decision-making system, that is, the statutory framework, the normative practice within this, the processes and procedures it promotes, and, in the case of government, the political environment within which it is located. Governance and institutional innovations for an enhanced approach to long term risk decision making may, therefore, not be sufficient in isolation, and we need to incorporate wider stakeholders in the process. For instance, barriers could strengthen each other or a 'solution' to a barrier may create a new one elsewhere in the system. Understanding how this occurs requires a wider contextual appreciation on barriers and decision-making contexts, where, for example, barriers can be viewed as opportunities for more collaboration as a means to drive wider change within a system rather than simply as obstacles (Burch, 2010).

Taking account of the background issues that contribute to decision making enables a broader perspective, one which closes the gap between a barrier and improved practice. For instance, issues such as the design of sustainable funding mechanisms, appropriate future scenarios, and the use of processes and procedures that address embedded cognitive logics and behaviours warrant consideration. These facets carry the potential to support more adaptive risk management decision making. For instance, if path-dependencies can be identified and addressed, this could lead to more flexibility in future arrangements. If improvements can be identified in multiple aspects then this should help enable a transition from the current arrangements to those that are more able to add flexibility and rigour to both the institutional frameworks and practices in this area.

The current decision-making environment can be understood within the context of the four idealised modes of governance which are arranged along the dimensions of time and complexity, and which can inform our understanding of decision-making for long-term risk management in heightened risk contexts, including the context of climate change. These are ideal-types, and the reality is that governance arrangements are typically combinations of these different modes, for instance, hierarchical and networked modes can often be identified within the same governing context. Nevertheless, examining modes of governance in this way is useful given that they are a useful heuristic by which to understand complex public management arrangements. Moreover, researchers no longer simply recommend a single mode to a particular context, but rather tend to recommend the hybridisation of various modes (Tenbensel, 2005). Rhodes (1997) captured this insight when he asserted in the title of his publication discussing governance that it's the mix that matters. It follows, then, that when examining different modes and their suitability, consideration needs to be given to their compatibilities, differences and tensions. In short, it allows us to better match the type of problem to the appropriate mix of governance response.

The preceding chapters revealed the emergence on a growing awareness among policy actors in the local government risk management sector of the need to address long-term uncertainty associated with the mitigation of natural hazard-related risk, and of the need for new institutional arrangements for doing so. Examples of emergent arrangements to better address the nature of the problem were the North Island LASS arrangements, and greater data sharing across local authorities associated with

attempts to develop a greater degree of connectedness between regional and district plans, which was driven by requirements within the Local Government Act 2002 for agencies to act in the most cost-effective manner. On the positive side, the lack of central government guidance has forced existing LASS's to evolve and adapt to include far wider risk management, insuring such assets that were previously uninsurable such as key arterial bridges (LASS, 2018). With regard to decision-making practices, there was evidence of the beginnings of a longer-term perspective that incorporated a greater understanding of risk in decision-making. However, more future orientated thinking around questions of adaptation was largely absent. Rather, short-term measures that are more operational than strategic in nature were found to be the dominant approach. There was some evidence that the actors within local government were beginning, albeit informally, to pursue greater levels of coordination across different levels of government.

However, despite some recent stronger governmental engagement with climate change, this research has revealed that local data collection associated with long-term decision making continued to be carried out by individual councils, leading to unnecessary instances of duplication, the collection of data in different formats, inconsistencies across local authorities, and sporadic regional practice. The absence of a coordinated national approach to establishing data that was easily shared and integrated was problematic, and played a large role in the creation of knowledge gaps and ambiguity.

Beyond the difficulties in pursuing more networked governance, the weak governmental signals and the tendency for councils to act in isolation also affects their ability to act in a way that achieve the benefits of the market mode of governance, such as local autonomy or ability to act swiftly. For instance, while smaller councils can enhance community participation and local democracy by utilising the closer connection between elected politicians, advisers, and the communities they serve, in terms of planning, funding and delivery of infrastructure small councils face significant disadvantages by comparison with larger councils. These include;

- a smaller rate payer base which constrains their ability to fund investment in infrastructure
- higher fixed costs per rate payer, and,

• reduced purchasing power

Regarding the purchasing of insurance towards the risk management of infrastructure, for example, a small council that is a member of a LASS arrangement can be compared favourably with a small council that is not. The council that acts in isolation simply has insufficient scale to engage effectively in the insurance market. The LASS member council has through its network arrangements access to more collective purchasing power which enables greater cover at a shared (ergo typically lower) cost allowing funds that would be otherwise spent on insurance cover to be allocated elsewhere in the community. Just as the blend of hierarchical and self-governance can be complementary to decision making in local government, the example of the LASS arrangement shows that there is also a potentially favourable relationship between network and market modes of governance.

At this juncture it is important to understand the decision-making approach that has been found to improve risk decision-making and conceptualise the governance arrangements that would facilitate this. The axes of the model have potential to assist in conceptualising the context of decision-making in terms of timing and complexity and inform the governance settings for decision-making.

8.6 Recommendations

The thesis so far has sought to develop the argument that there is a need to expand the forms of risk governance outside the boundaries of the current local and institutional frameworks and norms. This move fundamentally requires councils to shift from more short-term and simple considerations in decision making relating to the risk management of infrastructure towards more complex and longer-term thinking, which includes space for flexibility and adaptation over time. Given the importance of better decisions for current and future ratepayers, as well as environmental stewardship, table 9 seeks to summarise and link problems to barriers and evidence with a view to developing key recommendations that hold potential to influence governance. These are sector specific but informed by Boston's (2016a) suggestions for strengthening anticipatory governance, particularly in relation to long-term, complex risk management. Each key recommendation is then discussed in more depth.

Table 7: Summary of recommendations

Problem	Governance issues	Evidence	Recommendation theme
Lack of knowledge/expertise in terms of time and complexity of environmental risks	Complexity	Isolated/inconsistent data collection. Information not shared between councils LASS confined only to clusters on north island Inarticulate and inconsistent guidance from central government within legislation which is left open to interpretation	**1. Legislative reform to better describe the risk management role of TLAs** Amendment of key legislation and policy towards consistency of governance and decision making within local government to ensure stronger consideration of future risk and uncertainty, and a enable access for councils to a more coordinated approach to risk management funding **2. Greater coordination across TLAs** The mandating of all councils to create regional LASS arrangements towards the sharing of knowledge/resources/research, the achievement of economies of scale to provide opportunity and voice to all councils, and greater connectivity between councils towards coordinated risk
	Capacity Central/local government tensions	Elected representatives receiving limited options from management due to lack of institutional expertise Low confidence in advice and guidance provided by management to Elected representatives who then opt for outsourced knowledge, inhibiting a culture of institutional/sector learning Weak links between central government agencies that deal with risk management and local government	

			management and increased adaptive options

Cost of risk management	Organisation culture	Financial limitations present challenges for the funding of risk management Un/Underfunded data collection due to perception of a poor use of rate payer money for decision making Under investment in insurance and reliance on central government bailout from 60/40	**3. Accountability to the future** Implementation of policy requiring councils to produce interim formal risk reporting to central government articulating through increased sophistication in risk management regarding major risks, recent losses and trends, and progress on long term risk management
	fragmentation	Decisions are tied to tangible/popular community outcomes rather than underground/invisible future focussed investment. An operational and responsive approach to council service delivery. Governance decision making trends towards conservative/acceptable option and quickly operationalises long-term strategies. This creates path dependencies, confining risk management to an operational, not a strategic function which is fragmented from council to council.	**4. Fostering a culture of high trust and inclusive network for risk management** Organisational culture that promotes the values of trust and learning in risk management practice and processes towards the development of knowledge, competence and informed decision making underpinned by a greater inclusion of community voice

1. Legislative reform to better describe the risk management role of TLAs

A review and reform of legislation and local government policy provides the opportunity to improve regulatory performance in local government. There is the need for the establishment of articulated risk management measures by central government working with LGNZ, and requirements for councils to address a lack of a consistency in which regulatory functions are appropriately delivered nationally and locally. This articulation towards the protection of underground infrastructure could include:

- the establishment of what constitutes as acceptable risk shared by local and central government based on a risk-based approach to local demographics,
- clarity on the roles and responsibilities of government agencies for managing environmental risk and sharing knowledge and best practice, and
- the requirement of TLAs to produce longer-term focussed risk reporting, statements and plans to manage the natural environment of their region which includes such details as up to date and accurate valuations of assets versus their insured cover.

These examples will require more of a shared approach between central and local government to the provision of stronger policy to enable decision makers to govern future risk better. It should be noted that pockets of formal arrangements are in place to better address long term problems, and there are also the beginnings of more informal arrangements. However, this is not as easy as it could be, and the findings of Chapter 6 show that networks and working arrangements cannot simply be put together and expected to operate effectively without significant effort. An enhanced approach to Long Term Planning needs to be a major feature of these improvements; for instance, as there is strong evidence to suggest the underinsurance of infrastructure, a feature of these improvements needs to be the explicit requirement of a dedicated percentage of annual budgets directed towards future orientated risk management activities. The practice of devoting funds to risk management and post-event recovery outside of insurance cover is not a new notion, but is common practice in virtually all countries within South America which share a comparable, albeit more active at present, hazardscape to New Zealand in regards to earthquakes, tsunami and volcanic activity (World Bank, 2019). These hazards have highlighted the need to have a line dedicated to risk management and emergency response activities within the budgetary programme, which allows the government to quickly assign and monitor

resources specifically used for rapid emergency response activities. At the time of writing, national finances are dramatically depleted and there is a strong likelihood that these funds will simply be unavailable. Councils, therefore, are required to step up to the challenge of short, medium and long-term risk management decision making and the 60/40 arrangement must be phased out over the next few years to make space for a regional, and eventually national, connected approach to the risk management of infrastructure where knowledge and research are shared and financial economies of scale are recognised.

2. Greater coordination across TLAs

The current, sporadic LASS arrangements found only within the North Island indicate a successful model of regionally coordinated risk management arrangements. These arrangements are grounded in collaborative sharing across councils specifically in regards to information, data and pooled resources that provide access to the purchase the costly insurance of infrastructure. The economies of scale driven by requirements within the Local Government Act 2002 for local councils to act in the most cost-effective manner, achieved by this approach allows smaller councils to have a voice and access levels of risk managed through insurance cover that are financially unachievable if acting in isolation.

As discussed in Chapter 2, the current risk management arrangements have received criticism in the LGNZ (2013) report with regards to their insufficiency and inconsistency. The entry point to achieving this capability is through the establishment of formal networked arrangements. Through, for example, a risk management orientated LASS arrangement, this would allow regional clusters of councils to enhance consistency, affordability and shared accountability in risk management investment. The current approach by most councils is locally focussed and this approach is simply unfeasible if the levels of risk management decision making required in the future from the increased intensity and number of natural hazard events, from a budgetary perspective, are to be met. Doing this would also reduce the onus of central government to bail out underinsured councils. A cycle is required which establishes a culture of open sharing and the attainment of trust, and vice versa. The problem is that, in the absence of policies and standards that drive consistency in data gathering modelling and of comparable, relevant subjects, then one council's information may

not be of use to another and the cycle may fail. Furthermore, the smaller councils are found to be expectant/reliant on the larger councils to fund research, creating the free rider problem discussed in Chapter 2. Action is required in terms of the provision of education and specialist knowledge by central government to councils. This process of knowledge development can begin by gauging the current levels of local government risk management and abilities through mandated reporting. This exchange of information and knowledge bridges the current void created by the 60/40 arrangements which councils are found to rely on as a guaranteed cash handout for the shortfalls in risk management in a natural hazard event.

3. Accountability to the future

Currently, accountability reporting for local long-term risk management lies with elected representatives of individual councils. These reports and council deliberations are accessible to the public (if held in the public included section of the meeting), but the reports and their content lack any statutory basis. A clearer reporting mechanism, such as long-term reporting, has potential to bind the council to a particular course of action or to conform to specified norms (Boston, 2016b). In doing so, this imposes limitations on future actions, which may deviate from or undermine these commitments and will quickly identify reneging on previous decisions in favour of short-term, politically focussed pursuits, while promoting and maintaining social responsibility.

An area identified in Chapter 6, however, concerns the limitations in the understanding and representation of uncertainty. Good knowledge of risk at present was found to be focussed on specific regions. The quote in Chapter 6 by a local government general manager that “insurance companies only really know what we tell them, and the same can be said for every other council, so how do we know how we compare?” implies that local government risk practitioners shared the view that diversity in the outlook and the pressure of ongoing electoral achievement compounded opinions of councillors made it difficult for them to fully support and commit to long term risk management decisions. This presents a frustrating loop of contradictory conditions whereby administrative officials have insufficient risk management skills and/or knowledge seeking decisions from elected representatives who also have limited skills and, therefore, may be hesitant of long-term commitments.

At present, while government research programmes, such as the National Science Challenges, provide some dedicated foresight function for the identification of major risks by central government, there is no evidence of a centralised programme of academic or practice-led research devoted to local government risk foresight methodologies. The appointment of a central government centre of excellence set up to promote and disseminate forward focussed risk reporting would provide a consistent form of information for local government in long term risk management in areas such as climate change as well as issues such as pandemics. From a central government perspective, deeper knowledge about hazards, better risk management processes and practices, multi- and cascading risks, and any uncertain trends in social and environmental activity would enable it to shift from a reactive approach to the management of natural hazard events to a prepared proactive approach with a pre-emptive focus.

Of course, investment in the creation of a dedicated 'centre of excellence' in foresight and decision making cannot result in the predictions of all future risk, but it should be able to increase capacity to identify early warning signals through the systemic consideration of risk, trends and developments, as well as to take more precautionary approaches towards decision making in the face of significant future uncertainty. The framing of risk planning, and the effective communication of the outcomes is important if it is to be understood. However, to date there is no central government guidance on how this can be best delivered. Furthermore, information could be developed in a way that better responds to the diverse risk across the councils. The development of capacity and integration of new learning into everyday practice could take some time and, in turn, this will require will the progressive development of supporting hazard risk knowledge. However, the framing of risks in isolation will not address how this data can inform integrated long-term decision making on a national scale going forward. Rather, this affords supporting evidence by which possible options can be identified, assessed for viability and tested ahead of concluding decision-making. This process in itself is a crucial element in the procedure to long-term risk consideration.

4. Fostering a culture of high trust and inclusive network for risk management

Professional cultures within different local authorities were found to be largely as individual as the 'personality' of that local authority - which ranged from a conservative

and reactive attitude to a proactive culture on climate change. It is proposed that moving away from a reactive emergency management approach to risk to a more consistent anticipatory focus is essential, as described by a local government risk professional;

> "As a council we are absolutely issue responsive. If something happens we deal with it, but this just isn't sustainable. We'll wait until something happens and pay whatever we have to so that we can fix the problem. We can't just keep "fixing" things. We need to change this."

Doing so will be facilitated by a move towards a networked learning environment where knowledge and resources are shared to achieve long term risk management which incorporates flexible practices. To achieve this, an environment of trust must be created which promotes sharing and reliance on one another as part of building an effective, functional network rather than just a cross-council administrative arrangement to deliver outcomes. Achieving this will require greater power sharing where larger, potentially wealthier councils could provide a shared environment through a weighted cost-based approach to risk management that will enable economies of scale required to enable investment and adaptive decision making which would otherwise be unobtainable to the smaller councils. In turn central government could also ensure that adequate resources are available.

The citizens of the local communities should also not be forgotten as key stakeholders as they not only fund council activities through their rates contributions, but are also in receipt of the services that councils provide and the risks they manage. Within the Local Government Act 2002, a council must identify significant infrastructure issues and, more importantly, how they will be managed through financial investment, maintenance, risk management and insurance in consultation with their communities (Asquith, 2012). As such, the culture of trust and inclusiveness should extend to the local community and ensure that power is shared and that they are given a voice to ultimately assist in decision-making. Over the past decade, citizens have participated far more in multiple aspects of policy making and governance (Gurtoo & Williams, 2015). Public participation in decision-making is seen to generate more accountability, better performance and strengthening of democracy and this trend is increasing worldwide, particularly in Japan. By making knowledge of risks more public, it also

helps improve understanding of how the burden may be shared between current and future ratepayers. The future is uncertain. It is hard to predict-then-act. And in this context, there are much more value judgements at play that require community input.

8.7 Discussion and Conclusion – Towards more Anticipatory Governance

Boston (2016) states that there are three distinct goals that are useful in the local government context by which to instil the practice of anticipatory governance. The first is that it is preferable to build on and strengthen existing institutions, policy frameworks and processes rather than introduce new arrangements. In other words, local government can use the systems and processes already in place, but needs to find ways to improve their outcomes.

The second is to set goals that move decision-making horizons to be more future focussed. While the first goal is procedural the second addresses behaviour by changing decision horizons. This is not necessarily a job just for elected representatives who need to think outside of the triennial election cycle, but also in the way that information and knowledge is shared and options presented to them to enable longer-term decision making.

Finally, there is the need to learn from the past. This goal considers the wider framework which encompasses central government, outside the scope of devolution. This is a move from inconsistency and mixed messages in plans and policy, in which some dictate learning from the past, while others stating that global changes are unprecedented.

The combined insights from the literature review and the findings from the workshops and interviews with government actors and risk experts, has enabled a revision of the decision-making model towards this end. This final revision incorporates the more ‘informal’ arrangements that have been identified from the analysis of the research findings. Whilst the formal aims include rules, laws and structural arrangements, informal aims include the need for trust, social norms and values. This facilitates the appreciation of a range of phenomena, from unexpected outcomes such as change because of social innovation, to the identification and discarding of out-dated practices that are detrimental to adaptation.

Figure 9 revisits Figure 4, which was presented in Chapter 3 where four modes of governance were discussed: Hierarchical governance, self-governance, market governance and network governance. Each mode is useful but carries its own advantages and disadvantages in application to dilemmas of time and complexity. Figure 4 was grounded in the findings of the literature, and Figure 9 provides a revised overview of how the modes of governance are mapped against problems involving time and complexity and where each is most likely fit for purpose with the incorporation of the findings from real world examples identified from this research.

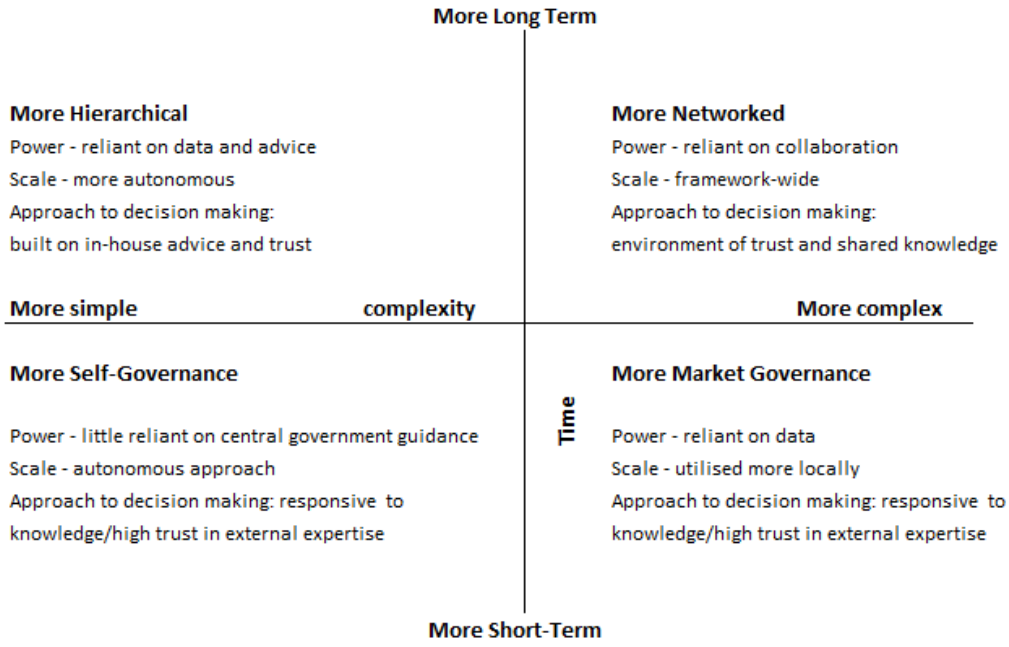

Figure 9: Fit-for-purpose decision making for risk

To summarise these revisions, the more hierarchical mode was one of two modes of decision making that was found to be extensively employed across local government. The driver for this was the inclination within each local body towards autonomy. However, the findings discussed in Chapter 6 show that this top down model, which is reliant on bottom up information, data and guidance, operated largely in a low trust governance environment highlighting the need for greater confidence in the accuracy of in-house advice.

The other mode found to be used extensively within local government was more self-governance. The elements in Figure 10 of power and scale reinforced the finding of an inclination within each local body towards autonomy whereby little reliance was

found to be made on central government guidance and more was placed on external expertise. Revisiting the findings from the literature from Chapter 3, this blended approach, which is virtually replicated across all of the councils involved in this research, is able to cover simple scenarios of decision making in relation to both short- and long-term problems. Although this practice allows a local body to focus on its own problems at a community level, the lack of formal funding for the data gathering of local natural hazard data discussed in Chapter 6 further highlights the limitations of informed decision making in practice.

In consideration of market governance, this mode was found to be used only in a limited way and when this happened, it tended to be in capital investment scenarios shifting the scale element from an original national/regional focus (see Figure 4) to more of a local focus.

The more significant change within the model is towards the more networked approach, particularly as it covers the long term, complex natural hazard risk management scenarios with which this research is concerned. The participatory aspect with shared power remains a constant. However, the barrier to the successful establishment of this mode concerns not only the requirement of collaborative sharing, but also an environment of trust.

Figure 4 presented a matrix of modes of governance which were mapped against the paradigms of time and complexity, based on the findings from the literature. Having revisited and revised the matrix in Figure 9 based on the findings from real world practice within local government, the next chapter will provide a concluding summary of the aims of this research, the findings and the contribution to knowledge that this thesis has provided.

Chapter 9 - Conclusions

9.1 Introduction

This final chapter begins with a review of the key influences leading to this research, and is followed by a summary of the research aims, and discussion of the findings and how they relate to the research aim, which was to examine:

To what extent do governance arrangements enable effective risk management decisions that protect government owned infrastructure from natural hazards.

In order to address this aim, four objectives were selected to determine the adequacy of the current framework and practice, namely:

1. to understand the current decision-making practices, how they are coordinated, and the implications for risk management;
2. to understand how the government framework enables these processes;
3. to identify how central government policy dictates and/or guides decision making at a local government level; and
4. to identify how short-term decision-making practices can be improved across local government to better manage long-term climate change risk.

The chapter concludes with suggested areas for future research, followed by concluding statements.

9.2 Key Influences – Research Rationale

This research began with a concern, drawn from personal experience, around the long-term governance arrangements for natural hazard-related risk management in relation to the protection of government owned three waters infrastructure. The criticisms of the '60/40' insurance arrangements by the Office of the Auditor-General New Zealand (2013) following the Christchurch earthquake series, which observed vertical failures of governance between local and central government as well as horizontal disconnects at a local level, led me to consider the extent to which climate change could affect local government on a national scale. The more I considered this problem it became apparent that there were multiple layers of complexity which affected the decisions made by councils that led me to question simplistic arguments about the causes and effects of a local authority underinvestment in risk management. This was a key driver which compelled me to undertake this research. The second

driver came when I began to conduct some initial research on this problem. This was a difficult task as, although there is much literature available on governance, decision making and government, there was little available that combined all three elements in this particular context. This meant that information was largely anecdotal and/or based on personal experiences and observations from presenting at national and international conference on local government risk management. Additionally, my experience at a senior management level spanning over 12 years within both central and local government highlighted the increasing complexity within the governance framework. These factors were a key influence in shaping this study.

9.3 Summary of the findings of the study aim and objectives

9.3.1 Reflecting upon the overall aim of the study

The broad focus of the aim was essentially concerned with improving risk governance in practice. Dovers and Hezri (2010) alluded to the complexity of risk management decision making when they stated:

> Institutions and institutional change are mentioned often, but rarely specified in discussions of climate adaptation. Policy change is proposed, but the detail of policy processes less often discussed. Detailed discussion of how to redesign policy processes and institutions are especially rare at the crucial jurisdictional scales of national and sub-national policy and planning.

This quote highlighted that efforts by organisations to improve are common and include initiatives for growth, efficiency and cost savings, but this is rarely the case in terms of climate adaptation and climate risk management. If we are to develop a deeper understanding of this problem, we need to acknowledge the practical financial angle in regards to the cost of risk management through insurance. An urban local authority such as the Christchurch City Council can expect to pay over a million dollars per annum, which will likely rise if climate change projections are accurate. Investment in insurance involves a trade-off between short-term and longer-term priorities, and in the case of the shortfall of insurance cover seen in the Christchurch earthquake series, it appeared that a short-term council view had been adopted (Local Government New Zealand, 2013).

This study, therefore, aimed to investigate the governance arrangements and decision practices that deal with uncertainty and risk, predominantly at a local government level. The study was also stimulated by Boston's (2016a, 2016b, 2017) research on the impact of institutional frameworks and politics on decision making, particularly in relation to conditions of uncertainty and change.

9.4 The Findings

The research involved interviews with 36 participants who had a direct connection to risk management decision making, either as subject matter experts, independent advisors to elected representatives, senior management and or in a governance role of some capacity. Additionally, over one hundred workshop attendees at the national and international local government and risk management conference provided input into the testing of the ideas about the decision-making matrix that was developed while carrying out the research. The research question, ***to what extent do governance arrangements enable effective risk management decisions that protect government owned infrastructure from natural hazards,*** was broken down into the four objectives discussed in section 8.1. The findings are presented below and are organised under the respective objective.

9.4.1. To understand the current decision-making practices, how they are coordinated, and the implications for risk management;

The first objective focussed on gathering information on how decisions were informed and made, predominantly within the local government sector in order to determine the ability to consider uncertainty and climate change. As a focus point to address this objective, Aven and Krohen's (2013) three stages of integrated risk management provided a useful benchmark by which to categorise risk management practice. Essentially paraphrasing the 31000 ISO national risk management standards, this model breaks risk down into three stages: the approach to understanding risk, the management of risk, and the forward-looking adaptation of risk controls.

As discussed in Chapter 6, given the limited knowledge of complex problems by local elected representatives, risk practitioners/advisors were found to use very traditional techniques, namely rating the 'consequences versus likelihood' as an analysis of risks which, to a large extent, can over simplify or obscure any technical information advice sourced from external expertise. As a result, advice given to decision makers at a local

level was found to be based on static, short term risk treatments, reinforcing the problem of introducing adaptable measures. As such, current decision-making practices were found in Chapter 7 to reflect the intent of managing risks, but reactively as opposed to proactively, and are largely influenced by entrenched historical practices. The findings point to path dependencies which have created locked-in current trajectories over long timeframes, and which are difficult, financially and operationally, to deviate from. Inconsistencies in practice, largely through the self-governance approach adopted by local government agencies and an arm's length practice by central government means that the subsidiarity devolvement of responsibilities are poorly developed. Whilst there were practices found which were moving to a more networked environment, such as the sharing of knowledge, the current framework is unsupportive of sustained coordination across councils.

Decision making within local government was found to be limited to short term, less complex objectives. As outlined in Chapter 1, decisions about risk management through insurance cover are made on a year-on-year renewal exercise, and this observation was confirmed in Chapters 6 and 7. These observations drew attention to the dimensions of time and complexity, and allowed for the creation of a matrix by which the more common modes of governance within local government could begin to be mapped. Introduced in Chapter 4, the matrix was modified as new insights were uncovered in subsequent chapters.

Trust was identified as a key aspect of environments where there were shared values in Chapter 3 and is also where Bevir (2006) proposes that networks thrive and hierarchies will fail. A key finding is that elected representatives have a pronounced lack of trust in administrative official's advice and, as a result preference is given to advice from external, independent experts, which can be costly. As mentioned in Chapter 6, attempts to increase understanding of local hazard risk through research was found not to be an activity with substantial budget support. The effect of this is reduced options for risk management presented to decision makers that are more aligned to short-term operationalisation of activities, further contributing to the comfort of short-termism.

Cumulatively, given the propensity for limited financial resources to fund hazard risk management and for elected representative to operate largely within the confines of the electoral cycle, within reform risk management will likely remain concentrated on the short-term. Furthermore, in an environment in which there is a general lack of trust by elected representatives of management advice and a small amount of coordination between councils and central government, it is unlikely that long-term, complex problems, can be easily addressed by individual councils.

9.4.2 To understand how the government framework enables these processes.

Chapter 6 evidenced that, whilst a precautionary approach to risk and risk management was present in a few councils via research designed to increase understanding of natural hazards, this was not commonplace. Whilst there was an awareness of the need for future orientated adaptive actions, the majority of participants report that their council's risk management focus was almost exclusively on the transference of risk via annual insurance with reliance on the central government 60/40 arrangement in a natural hazard event.

Local government has potential to adopt an adaptive risk management approach, but the research identifies how this is hindered by two key aspects. The first, as evidenced in Chapters 6 and 7, was an approach to risk decision making in isolation. Local authorities are responsible for the enactment of the relevant statutes, but as found in Chapter 6, they operate largely in a self-governance mode little central government interaction. Legislation, therefore, is interpreted on a local level, which may not necessarily reflect the Act's intent, but for the betterment or convenience of the individual council's decision making. Four examples were found where councils maintained a coordinated risk management programme through a LASS arrangement. These clusters were found to address wider, cross boundary issues and achieve economies of scale to the degree that contribution by the larger councils financially enabled the smaller authorities to achieve increased resilience. These clusters were only present within the North Island, but there is evidence that some informal networks have begun in earnest by local government administrative officials and risk practitioners across scales and within their organisations. However, these arrangements were largely informal in nature and without any formal coordination or

finance. The institutional framework, therefore, contains numerous elements that have good potential to understand and manage uncertainty through long-term, risk-based decision making. However, the conditions required to accommodate future orientated adaptive actions are largely missing, networked responsibilities across governance scales are inhibited, and the statutes and guidance documentation is inconsistent.

The competing priorities of business as usual council operations and the desire for elected decision makers to remain elected presents a distraction culminates in an 'out of sight, out of mind' approach over long term action as discussed in Chapters 6 and 7. This is coupled with the emergence of environmentally driven 'creeping' problems which struggle to be supported by consistent up-to-date hazard timing guidelines, many of which are expensive to investigate/remediate, but also likely to be cross-boundary thus requiring a coordinated responses. Increasing this coordination is often difficult due to the structure of New Zealand's government departments and agencies which typically sees local government agencies acting in isolation. Finally, given that these risks are complex and lack definitive solutions, cost may play a significant role and the call for increased attention, interaction and funding from central government was a common comment made in the interviews. In its current state, risk management decision making falls disproportionately in the short term. With the benefits of future focussed risk management often unrealised for many years, it was found that increased attention by decision makers within the triennial election cycle is unlikely.

9.4.3 To identify how central government policy dictates and/or guides decision making at a local government level

Driven by a lack of funding, coordination, and a tendency to obtain advice from different sources, different local authorities were acting on different assessments of risk. This piecemeal approach was an outcome of localised interpretations of central government policy. The negative effects of highly localised interpretations were exacerbated by what was observed to be contradictory information from central government, as found in flood planning guidance of 'Preparing for Coastal Change' (Ministry for the Environment, 2017) and 'Preparing for Flooding' (Ministry for the Environment, 2010). The result was difficulty the sharing of risk analyses between councils, and this undermined a more coordinated local government approach to risk.

In regards to the key legislation associated with environmental risk, central government guidance promoted a precautionary and risk-based approach to planning for natural hazards. Whilst the Resource Management Act 1991 and in particular section 32 is currently under review, the assessments are largely risk-based and recognise the need for flexibility, but is silent on the need for change over time. The Civil Defence and Emergency Management Act 2002 is reasonably clear regarding both precautionary actions and risk management, but takes a relatively short term and uncoordinated view of preparedness.

The role of central government within the governance arrangements is to direct changes through policy and legislation that reflects shifting risks, values and new knowledge. Central government, of course, evolves in response to changes in values and to changes in priorities driven by changing circumstances and interest groups. There is, therefore, much scope for local government to work alongside (rather than for) central government across decision making scales towards climate change adaptation. However, the research suggests this is most likely to occur outside of the confines of the formal framework and its processes, rather via more of a formal networked arrangement.

However, the statement that many local authorities, “see themselves as autonomous bodies and feel that central government agencies sometimes treat local authorities as local offices or branches”. (Department of the Prime Minister and Cabinet New Zealand, 2019, p. 30) is important in that if councils view themselves as autonomous, this carries the potential for continued localised interpretation of legislation and isolated decision making. In short, central government need to recognise the variation that currently exists in how the powers are exercised in each area and the issues this raises for aspects such as more networked governance. The LASS arrangements are an example of a successful collaborative approach between clusters of councils towards a self-interest way of meeting their 60/40 obligations and managing risk in accordance with legislation without any influence or interference by central government.

9.4.4 To identify how short-term decision-making practices can be improved across local government to better manage long-term climate change risk.

Given these findings, we now briefly summarise the key high-level recommendations:

A coordinated approach to funding insurable risk management

In consideration of the criticisms of the 60/40 insurance arrangements, much of the financial shortfall of reparations following the Christchurch earthquakes series were a direct result of local government underinsurance. To avoid the future financial exposure of central government and breach of local authorities' requirement to fund 40% insurance cover, further LASS arrangements could provide the economies of scale to make this option financially viable across all local authorities. Cost in the literal sense is found to be problematic across of the councils which were interviewed. This could include increased funding for risk management research/information gathering, but also the formal recognition and funding required for councils to form coordinated groups.

A coordinated approach to knowledge acquisition

The common denominator between the tensions between central and local government through council's localised approach to policy interpretation and subsequent decision making is isolated approaches to risk management and the acquirement of knowledge. There is both a need for greater coordination across local government clusters with the LASS arrangement providing a template approach that is proving to deliver positive outcomes. Secondly is a greater presence by central government in the better coordination and description of roles between councils and central government agencies within legislation.

Fostering a culture of trust

Finally, there is the requirement for a culture of trust to be formed. This includes trust between elected representatives and administrative officials, but also between local and central government. Trust cannot be financially procured, but the cost of information required to provide decision makers with information rich options can assist in this process, as can guidance that fosters and encourages more networked approaches.

The matrix outlined in Figure 9 also has potential to assist in the improvement of risk-related decision-making practice. The matrix evolved throughout the research as further knowledge on local government decision making practice was acquired, and was grounded in the findings from the literature on modes of governance and on dimensions of time and complexity. It has potential to communicate these issues and inform decision makers as they approach short term or long-term problems that are either complex or simple. By utilising this approach, decision making can be arranged in a mode of governance best suited to the problem. This assists in a shift away from the current practice of using a hierarchical/self-governance method as a blanket approach to all problems, regardless of time and complexity.

Increased sophistication in risk assessment

A final recommendation the consideration of more sophisticated environmental risk assessment tools. At present, current practice is aligned to ISO:31000 standards for all risk management assessments, that is the same approach of likelihood versus consequence for environmental hazard risks as well as corporate risks. Approaches to the appraisal of risks that go beyond these dimensions to include further uncertainty characteristics such as the rate of change (velocity) (trends), and slow onset sudden tipping point (shocks). This move towards greater sophistication would necessitate increased knowledge and maturity in risk management practices on the part of councils, but would almost certainly improve the level of mitigation and event response.

9.5 Contribution to Literature

This thesis makes a new and necessary contribution to the literature through understanding how uncertainty and long-term decision making is currently conducted within New Zealand governance arrangements, and how it could be potentially improved by drawing upon theories connected to uncertainty and long-term decision making. The development and use of a new approach based around a deeper consideration of modes of governance and how they map against the dilemmas of time and complexity offers a means to bridge the gap between and practice that is grounded in my positioning as a researcher. While there is much research on government, decision making and governance, this research seeks to link these more tightly together via their consideration within a particular practice problem. There are

numerous instances where published literature concurs with the findings of this research and this is predominately found in Boston's (2016a, 2016b, 2017) research on anticipatory governance in respect to the issues of short-termism in decision making within local government. The issues discussed in this thesis further contributes to the body of knowledge regarding decision making in New Zealand's local government environment, as well as to debates on long term environmental risks to New Zealand and how prepared government are to manage them. Although this thesis has focussed on risk management decision making within the New Zealand government environment, it is anticipated the findings are likely applicable with comparable developed Western democratic frameworks beyond those of Aotearoa.

9.6 Suggestions for further research

The research has considered the New Zealand government framework for long-term risk management and related decision-making practices. Although this is made in one small element of state infrastructure, by situating this within a wider theoretical consideration of climate change and issues of time and complexity, it is hoped that the findings can contribute to further studies and can be reinterpreted accordingly. A number of the findings made within this thesis are consistent with those in previous literature and, therefore, validates and adds to existing research and knowledge.

The new findings which link risk management and climate change with government and decision making provides a potentially valuable lens by which to consider similar research questions across other overseas government sectors that share comparative values with New Zealand. For instance, many of the findings in this thesis are supported by the findings in similar Australian studies and therefore not wholly unique to New Zealand. These challenges include limited access to information, inconsistent problem definitions and framework planning, and competing priorities for limited resources[15]. This thesis, therefore, provides an addition to the growing empirical body of knowledge concerning decision making, long term risk and institutional design as it applies to addressing the dilemma of uncertainty and climate change.

However, this research represents a snapshot in time within an environment that is evolving. At the time of writing this concluding chapter, the Government launched the

[15] See Measham et al, (2011) in terms of the Australian perspectives.

Three Waters Reform Programme – a three-year programme designed to reform local government three waters service delivery arrangements. Local government continues to face urgent challenges in the provision of these services. These challenges are not new and have been the subject of much discussion throughout this research. The challenges include: funding, legislative compliance, supporting population growth and, of course, the futureproofing of infrastructure against natural hazards and climate change.

This research has identified short-term, piecemeal orientated solutions when comprehensive, system-wide reform is required to achieve long-term benefits for the local government sector, our communities, and the environment. The exact size, shape and design of these entities is a work in progress, but presents an emerging agenda for future research. This three-year reform presents a short term, complex scenario. Using the matrix that this research has presented, this places the problem in the more market governance environment with a reliance on data, a more local scaled approach, and a decision-making practice that is responsive to knowledge and high trust in external expertise. This description fits the nature of this problem, and future research will tell if the current data and practice gaps have been addressed.

9.7 Concluding statement

Several weeks ago, during a conversation with a local government chief executive, an interesting comment was made. They said that this research topic is “novel, interesting and raises the profile of what is important not only for councils going forward, but also our communities”. At the time of writing, a global pandemic continues. It is probably fair to say that the New Zealand government’s handling of this has far outperformed the rest of the world under significant conditions of uncertainty. Central government has demonstrated clear leadership and guidance and there has been a high degree of consistency and compliance in the response.

New Zealand is not unlike any other country whereby the pandemic presented a significant environment of uncertainty and prioritisation of economic continuation of business, the risks of mass unemployment, and of course community resilience. There was no choice but to adopt an agile and reactive response to this problem by government. A year later, through short-term decisions such as border control and the

enforced isolation of travellers arriving to the country, communities enjoy what can be considered a far more relaxed state than those found in other countries. Reactive decisions continue to be made in regionalised snap lock downs, but what about the future? Is the pandemic going away any time soon? This is almost certainly a long-term complex problem for decision makers and an anticipatory approach will be required.

This research makes a clear statement that the dilemmas of timing and complexity influence the understanding of barriers to risk management through the creation of organisational structures and rules to detect and quantify threats. By understanding risk exposure, this enables planning for effective responses which can be supported by formal networks. These elements contribute to a professional learning ethic focussed on establishing improved certainty for making better informed decisions in future orientated situations. This is a key finding that could easily and positively assist in advancing the matters that have been identified as wanting within both the institutional framework and the practice of risk management across multiple scales.

Given that I have worked extensively within local and central government, this potentially presented some limitations to this research. For instance, being known to some attendees at government conferences initiated some great discussion, but also may have hindered those from central government, worried their comments may be fed directly back to councils. Of course, assurance was given that this would not happen, however such factors are difficult to mitigate in the absence of time within which to build rapport and confidence in a conference environment.

Finally, a limitation arises from the presentation of the research findings, as all interview responses required interpretation. Although every care was taken to present the comments in the context that they were made, there is the risk that a statement may have been presented outside of the intent by which it was made.

In closing, I would like to comment on how I have grown as a research as a result of this study. This is presented under four distinct areas.

Patience - Given my background in government, I was too eager to use my existing knowledge and admit to being impatient and wanting to do everything at once. Throughout this process I have gradually learned to give adequate time to read, think

and discuss ideas. Being patient has helped me to improve the clarity of my thinking and has resulted in less errors and flaws.

Keep reading – This was a mantra instilled from day one by my supervisors. The more I read, the more I learn and the better I (and my ideas) will be.

Presentation and public speaking – Good communication is a much-required skill in research. The ability to be able to present my research along the way, convince others of its importance and collaborate over its development cannot be understated.

Dedication– I chose to place this development last so that it stays in my mind going forward.

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Appendices

Appendix A: Participant Consent Form

UNIVERSITY OF WAIKATO FACULTY OF ARTS & SOCIAL SCIENCES

PARTICIPANT CONSENT FORM

A completed copy of this form should be retained by both the researcher and the participant

Name of person interviewed _____

I have received a copy of the Information Sheet describing the research project. Any questions that I have, relating to the research, have been answered to my satisfaction. I understand that I can ask further questions about the research at any time during my participation, and that I can withdraw my participation at any time up to four weeks after the interview.

During the interview, I understand that I do not have to answer questions unless I am happy to talk about the topic. I can stop the interview at any time, and I can ask to have the recording device turned off at any time.

When I sign this consent form, I will retain ownership of my interview, but I give consent for the researcher to use the interview for the purposes of the research outlined in the Information Sheet.

I understand that my identity will remain confidential in the presentation/publishing of the final research findings.

Please complete the following checklist. Tick [✓] the appropriate box for each point.	**YES**	**NO**
I wish to receive a copy of the findings.		

Participant :		Researcher :	David Robson
Signature :		Signature :	
Date :		Date :	
Contact Details :		Contact Details :	Tel 0210 265 4993

Appendix B: Participant Information Sheet

UNIVERSITY OF WAIKATO FACULTY OF ARTS & SOCIAL SCIENCES

PARTICIPANT INFORMATION SHEET

Project Title

Future New Zealand Risk: Towards Anticipatory Governance of Infrastructure

Introduction

My name is David Robson and I am carrying out doctoral research examining the governance of risk management in New Zealand, particularly as it relates to government owned infrastructure. My focus is on the sustainability of these arrangements in the face of emerging environmental threats. The aim is to gain insights into how to improve local and central government relationships and decision-making processes around infrastructure risk management.

I am approaching you to see if you would be willing to participate in an interview given your experience in government and/or risk management and your potential to provide relevant, grounded insights into governance and risk management. The interview should take between 45 and 60 minutes, and I enclose a copy of the questions I will ask. I have also enclosed a diagram that I plan to refer to during the interview.

What will happen to the information collected?

Your interview will contribute to my PhD thesis, and possibly to articles and presentations that come out of the research. Only my supervisors and I will be privy to the notes, documents, and recordings, and once the research is completed, these will be destroyed or erased. I will keep transcriptions of the recordings and a copy of the paper, but will treat them with the strictest confidentiality. As a participant, you will not be named in any subsequent publications and every effort will be made to disguise your identity.

Declaration to participants

If you take part in the study, you have the right to:

- Ask any further questions about the study that occurs to you during your participation;
- Be given access to a summary of findings from the study when it is concluded; and
- Refuse to answer any particular question, and to withdraw from the study up to four weeks following the workshop or interview.

This research project has been approved by the Human Research Ethics Committee of the Faculty of Arts and Social Sciences. Any questions about the ethical conduct of this research may be sent to the Secretary of the Committee, email fass-ethics@waikato.ac.nz, postal address, Faculty of Arts and Social Sciences, Te Kura Kete Aronui, University of Waikato, Te Whare Wananga o Waikato, Private Bag 3105, Hamilton 3240.

Who's responsible?

If you have any questions or concerns about the project, either now or in the future, please feel free to contact either:

Researcher: David Robson – tel 0210 265 4993/ drobson@waikato.ac.nz

Supervisors: Prof Iain White (iain.white@waikato.ac.nz) and Dr Pat Barrett pat.barrett@waikato.ac.nz)

Appendix C: Semi-structured Interview Questions

Aim: to better understand the governance of risk management, and to support the development of better governance arrangements.

1. Tell me about your role and experience of working in risk-based problem management *(any specific stories?)*

2. When interacting with central government/across other government agencies, what is the nature of those interactions and who tends to hold the power in the relationship/arrangement?

3. Reflecting on your experience, how effective are the structures in place for decision making? (Refer to chart – what might have worked better?)

4. What are the main barriers to effective decision making, specifically at a stage where there is some unknown as to the timing and complexity of a problem?

5. Ideally, what changes need to occur to improve the quality of the arrangements to achieve an ideal level of service?

6. And to achieve an acceptable level?

7. Going forward, what do you think will be needed from elected representatives and local/central government arrangements to support sustainable decision making for longer term complex problems such as climate change? (*re sustainable, consider environmental, political, economic – tailor as appropriate*)

Appendix D: University of Waikato Ethics Approval

Geography Programme
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David Robson Iain White Patrick Barratt

Political Science & Public Policy Programme, Environment Planning

18 October 2017

Dear David,

Re: FS2017-49 Future New Zealand Risk: Towards Anticipatory Governance of Infrastructure

Thank you for submitting your application to the FASS Human Research Ethics Committee. We have reviewed the final electronic version of your application and the Committee is now pleased to offer formal approval for your research activities, including the following:

- A workshop at the SOLGM National Risk Management Conference 2018.
- Semi-structured interviews with central and local government employees

Before beginning your data collection, the Committee asks that you place your Information Sheets and Consent Forms on University of Waikato letterhead.

If you have not done so already, we ask that you please provide Eileen Fenner, the FASS Ethics Committee Administrator, with a paper copy of your final application that has been signed by yourself and your supervisor.

We encourage you to contact the committee should issues arise during your data collection, or should you wish to add further research activities or make changes to your project as it unfolds. We wish you all the best with your research. Thank-you for engaging with the process of Ethical Review.

Regards,

Colin McLeay,

Chair Faculty of Arts and Social Sciences Human Research Ethics Committee